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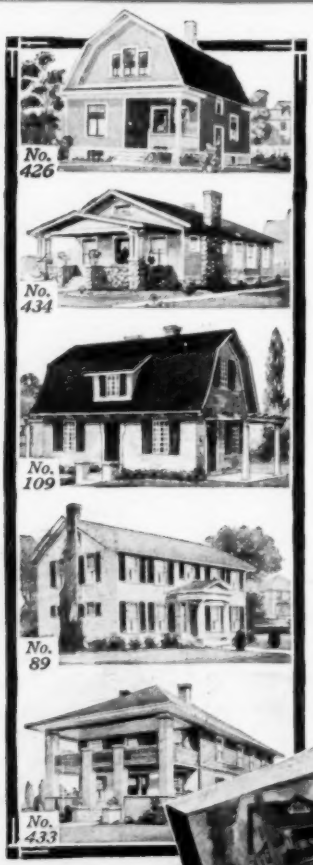
POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

Drafting in 1863

HARRIS HOMES



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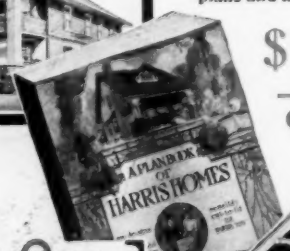

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Popular Mechanics Magazine

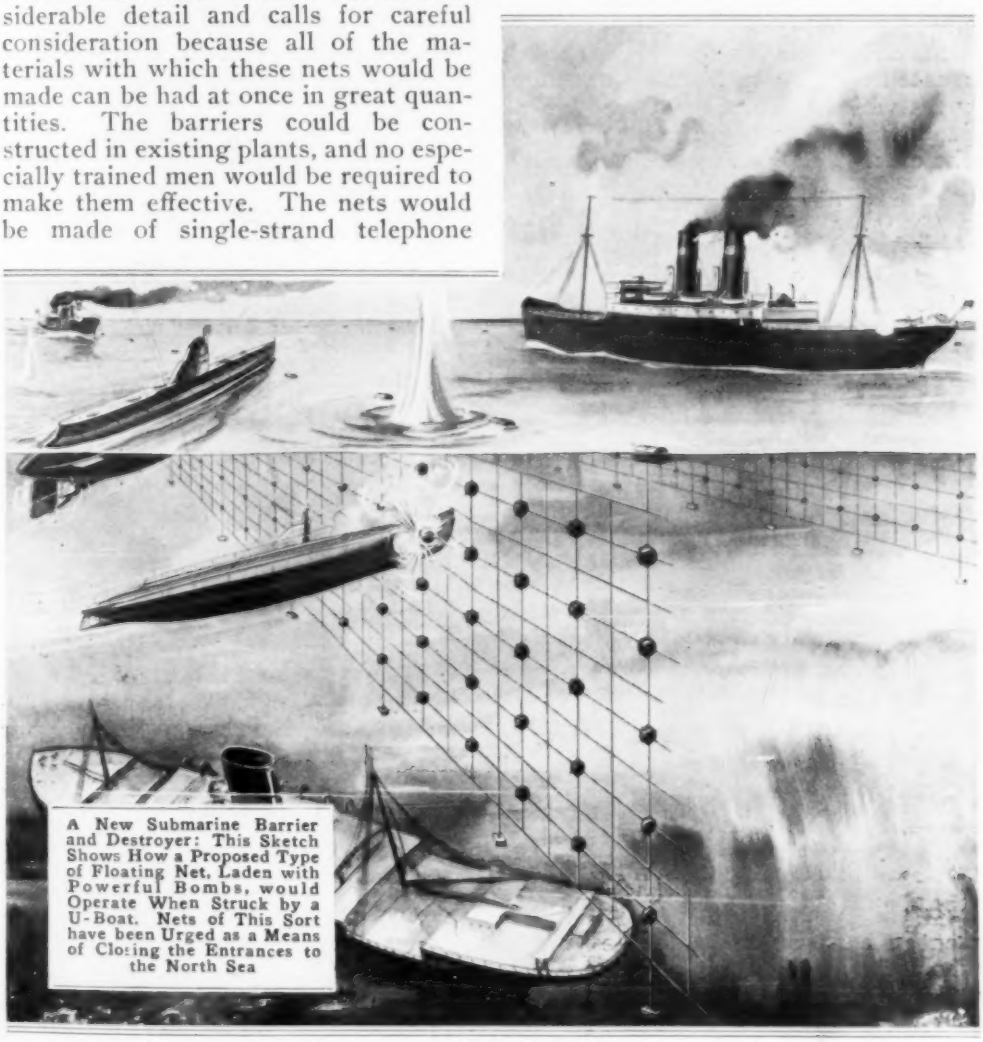
REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 28 SEPTEMBER, 1917 No. 3

Floating Bomb-Laden Net to Foil Submarines

DRIFTING, explosive snare nets, stretched across the entrances to the North Sea or forming protected lanes across the Atlantic have been proposed as a means of defeating the German submarines. This comprehensive scheme has been worked out in considerable detail and calls for careful consideration because all of the materials with which these nets would be made can be had at once in great quantities. The barriers could be constructed in existing plants, and no especially trained men would be required to make them effective. The nets would be made of single-strand telephone wire, with 15 or 20-ft. meshes, and to them bombs would be attached which would explode on being struck by a submarine. These bombs would be similar to hand grenades but more powerful. The nets would hang to a



A New Submarine Barrier and Destroyer: This Sketch Shows How a Proposed Type of Floating Net, Laden with Powerful Bombs, would Operate When Struck by a U-Boat. Nets of This Sort have been Urged as a Means of Closing the Entrances to the North Sea

depth of about 200 feet, or below the depth to which a submarine can go. Oil barrels would serve as buoys. It is apparent that it would be a sorry day for the U-boat that tried to cut its way through one of these nets with any of the cutting devices which the Germans are reported to have devised and placed on the exterior of their submarines.

With a sufficient number of these nets extending from Scotland to Norway and across the English Channel, if necessary, the inventor believes that these North Sea entrances could be closed to underwater craft. Another use for them would be to form a protected steamship lane by stretching two rows of nets across the Atlantic. In case a submarine rose to the surface, in an effort to destroy or pass over the nets, patrol boats which could be kept on duty could attack the enemy craft.

TWO FOCUSING SCALES USED ON FOLDING CAMERA

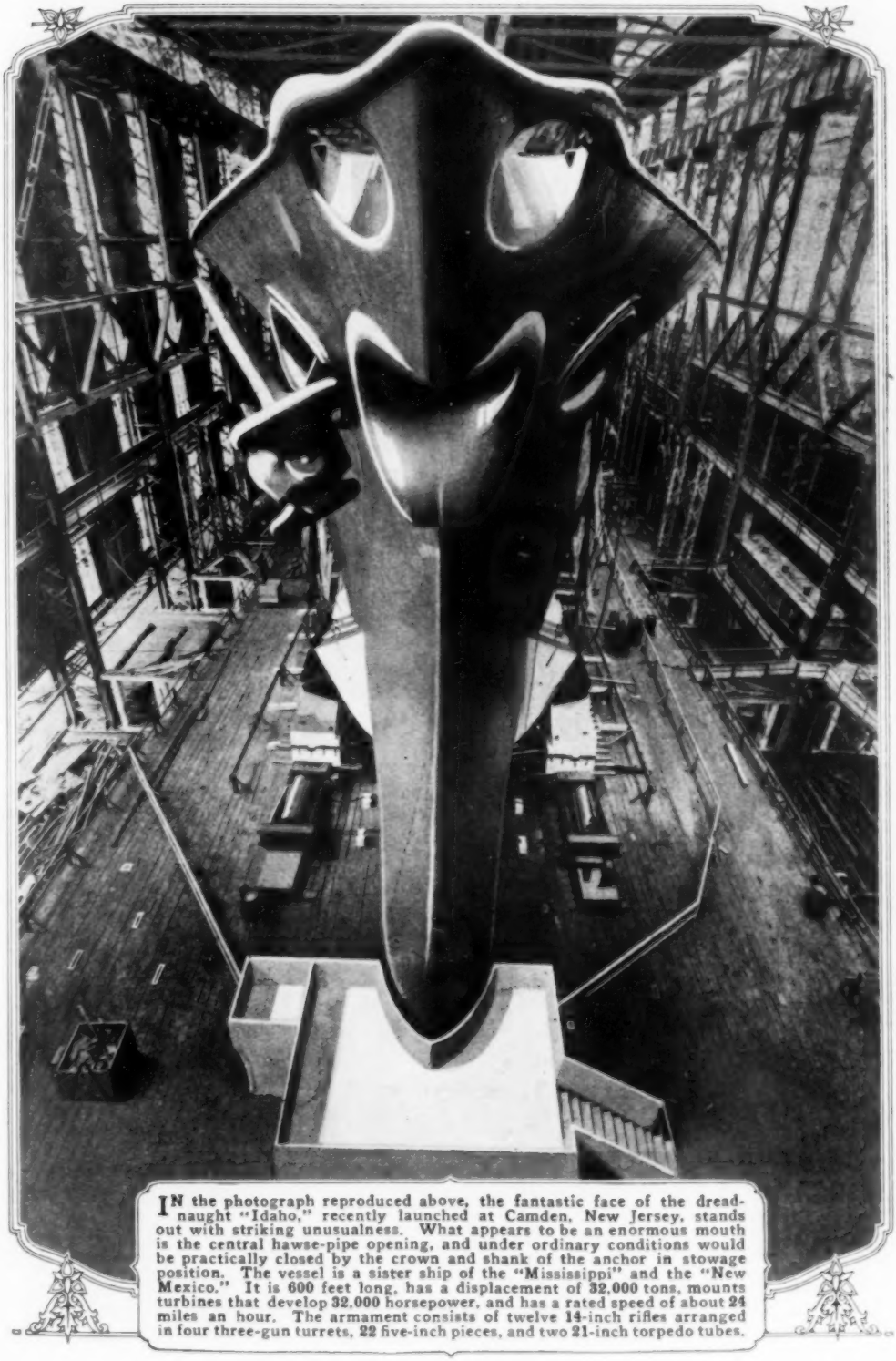
One of the radical features of a high-grade folding camera that has been introduced especially for the particular amateur, is a new focusing arrangement which permits the necessary adjustments to be made before opening the case. The advantage of this refinement will be apparent to the person who is practiced in making exposures under trying conditions that call for speed. The exterior scale is provided on the front side of the case. When the opening button is pressed, the front drops into place, and the lens and shutter holder, attached to the bellows, automatically move out to the proper focal distance and lock.

The Special Focusing Arrangement is Provided in Addition to the Usual Means of Adjustment

DESTRUCTION OF IRON A PROBLEM IN TROPICS

People living in temperate climates have little conception of the heavy expense and great inconvenience which dwellers in many parts of the tropics are subject to because of the rapid deterioration of iron. The humidity, together with the penetrating salt in the atmosphere, if one is located near the sea, serves rapidly to corrode metal parts or structures which, in other regions, would last a lifetime. For example, in the South Sea Islands corrugated roofing of galvanized iron will be covered with red rust within from five to seven years. Because of this condition pure brass is much in demand, particularly for boat and other marine fixtures. Hooks, pins, and other fittings which are merely coated with brass, or are bronzed, go to pieces within a few months under the action of the elements and so are not worth buying even at low prices. The tendency is for wood also to decay rapidly in a humid tropical climate.

MASSIVE STEEL FIGHTER TAKES MAIDEN PLUNGE



IN the photograph reproduced above, the fantastic face of the dreadnaught "Idaho," recently launched at Camden, New Jersey, stands out with striking unusualness. What appears to be an enormous mouth is the central hawse-pipe opening, and under ordinary conditions would be practically closed by the crown and shank of the anchor in stowage position. The vessel is a sister ship of the "Mississippi" and the "New Mexico." It is 600 feet long, has a displacement of 32,000 tons, mounts turbines that develop 32,000 horsepower, and has a rated speed of about 24 miles an hour. The armament consists of twelve 14-inch rifles arranged in four three-gun turrets, 22 five-inch pieces, and two 21-inch torpedo tubes.

SERVICE FLAG IS DESIGNED AS FAMILY HONOR EMBLEM

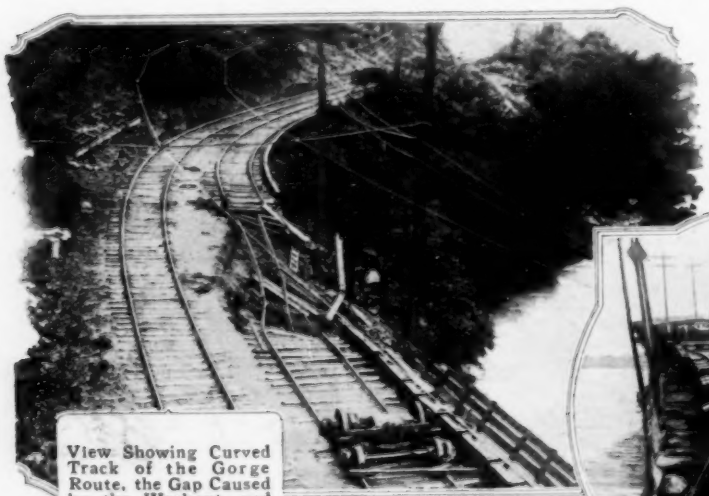
Attempt is being made to gain national recognition for a service flag that

Service Flag Adopted Officially by the City of Cleveland and the State of Ohio

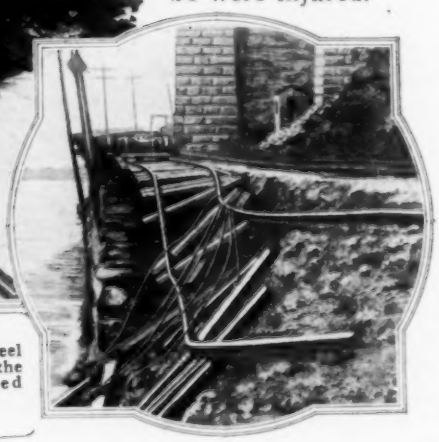
has been officially adopted by the city of Cleveland and the state of Ohio. It is an emblem of honor to be displayed with Old Glory by every family that has one or more members in active war service. The flag is two by three feet in size and consists of one or several blue stars charged on a white field surrounded by a red border, six inches in width. For each enlisted or commissioned member of a family, a five-pointed star, which measures five inches between opposite points, is provided.

TERRIBLE NIAGARA WRECK UNDER INVESTIGATION

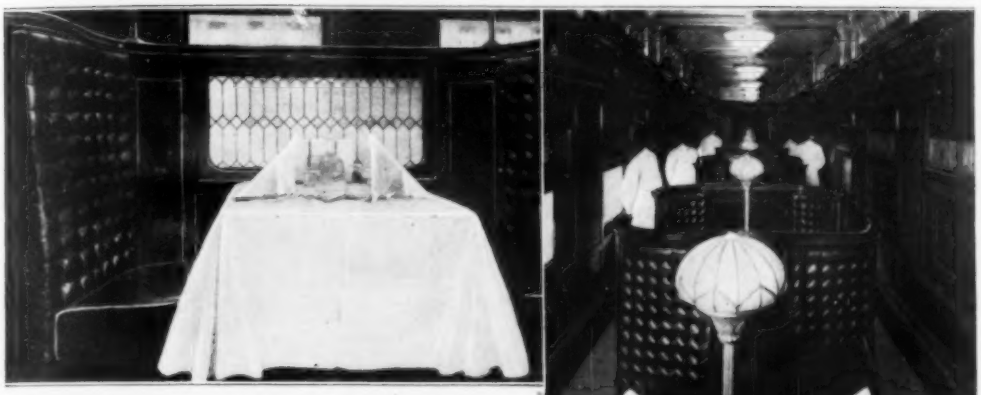
Protracted investigations, instituted by various authorities, have been seeking to ascertain how such a washout as that which caused the terrible wreck on the gorge trolley route at Niagara Falls, could go unnoticed by those who are responsible for the safe operation of this famous scenic railway. As the accompanying illustrations show, the portion of the track which was undermined was several yards in extent and must have been considerable time in forming. Some 50 persons were in the car that plunged down the 20-ft. embankment into the mighty rapids below, and according to revised reports 10 of these were killed, 4 were missing and believed drowned, and 24 were injured.



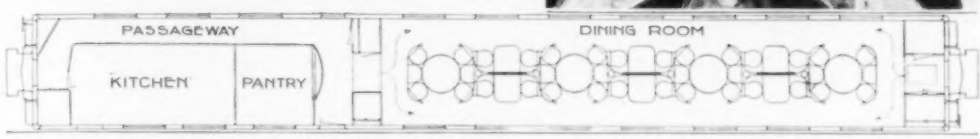
View Showing Curved Track of the Gorge Route, the Gap Caused by the Washout, and the 20-Foot Embankment over Which the Loaded Trolley Car Plunged into the Rapids Below



What Fragile Things the Steel Rails Proved to Be When the Embankment was Washed Away is Shown Here



Above is Shown One of the Compartments Divided so as to Provide a Semiprivate Booth for Two Persons. The Picture at the Right Gives a Good Conception of the General Character of the Car



The Drawing Explains in Detail the Whole Arrangement of the New Dining Car, Which is Intended to Afford Patrons Comfort and Convenience While Enjoying Their Meals En Route

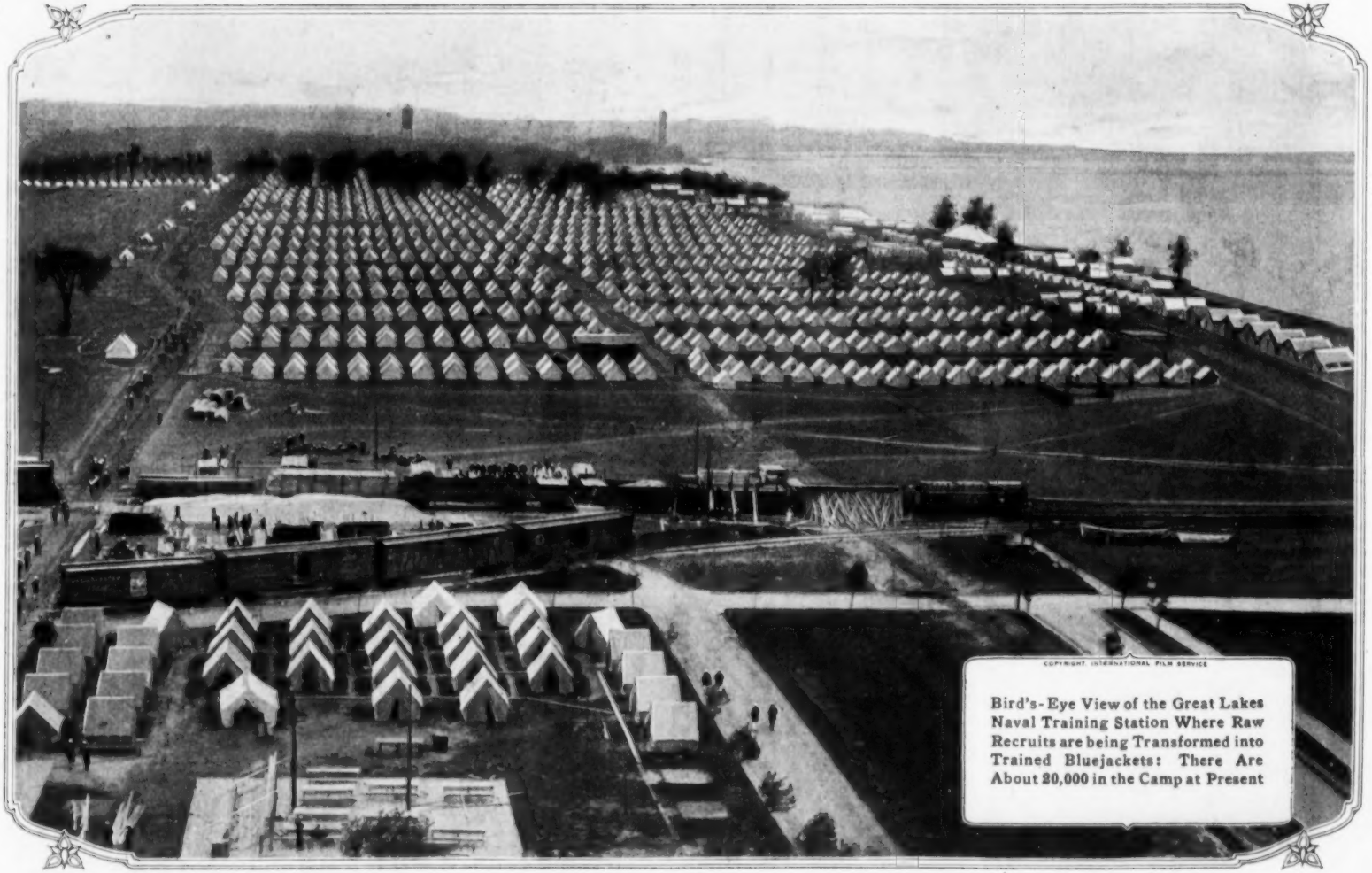
DINERS AFFORDED PRIVACY IN NEWLY PLANNED CARS

To promote the comfort and privacy of its patrons, the Erie Railroad has placed in service some dining cars of new character that, from the traveler's standpoint at least, mark a welcome departure from the conventional arrangement. Seven compartments are provided in the middle of the car. Four of these are supplied with large round tables designed to accommodate two couples, or, when necessary, six persons. The alternate booths are convertible. Removable leaded-glass screens divide them so that six tables, each for two diners, are formed. By removing one of the partitions a rectangular table large enough for four persons is made available. An aisle extends along each side of the room, separating the compartments from the walls. This arrangement permits the car windows to be opened during warm weather without causing strong air currents to blow across the tables. The plan is an excellent example of the passengers' comfort and convenience being placed before seating capacity.

JAPANESE PIPE CLEANER HAS PORTABLE OUTFIT

Cleaning tobacco pipes is a trade which affords a livelihood for many an itinerant worker in Japan. The outfit needed to perform this task for Oriental smokers is carried in a covered two-wheel pushcart, and includes a little copper kettle from which a jet of steam is forced into the stem of the pipe, after the latter has been swabbed out and dried with a wire and cloth.

Japanese Itinerant Worker Cleaning a Smoker's Pipe: His Portable Outfit Includes a Little Copper Boiler from Which a Jet of Steam is Forced into the Pipe After It has been Swabbed Out



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Bird's-Eye View of the Great Lakes Naval Training Station Where Raw Recruits are being Transformed into Trained Bluejackets: There Are About 20,000 in the Camp at Present

THE BLUEJACKET FACTORY OF THE GREAT LAKES

By JACK LAIT

MAKING salt-water sailors out of well-water farmers, fresh-water mechanics, and soda-water clerks is Capt. W. A. Moffett's "bit" at the government's Great Lakes Naval Training Station, a few miles north of Chicago on the shore of Lake Michigan.

Before you will have read this, about 25,000 willing young fellows will have passed through the institution and will be "somewhere on the ocean," or in "an Atlantic port," naval men on active duty.

In May they were scattered through the Middle West—Illinois, Wisconsin, Michigan, Iowa, the Dakotas, Minnesota, Missouri, Arkansas, Louisiana, Tennessee, Kentucky and Indiana—in all callings and all social subdivisions. Not one in twenty of them had ever seen an ocean before he wore his uniform on one, and comparatively few had ever seen a water body of any magnitude at all before they took a peep over the parapet at the training camp and beheld the choppy surface of Lake Michigan.

John Philip Sousa, the Renowned Bandmaster, Now a Lieutenant, in Conversation with Officers at the Great Lakes Naval Training Station

Moreover, most of these "Jackies" had never been on a boat more formidable than a flat-bottom skiff or, perhaps, a picnic excursion "Jenny,"—and no more had they when their preparation was virtually complete, for, strange to relate, this rapid-fire school for graduating seamen holds classes entirely on dry land. There is a government cutter in the little harbor, and there is a pony training ship, formerly a unit of the Spanish navy, captured by Schley, which cruises between Great Lakes and Chicago, more for advertising and recruiting display than for practice work.

Steering, rigging, splicing, navigating, naval gunning, torpedo "planting," deck washing (called "walloping"), deep-sea discipline, lifeboat manning, topmast observation, maritime cooking, and marine signaling, all are taught and all must be learned in buildings or on grass plots.

And they must be learned at double-quick speed, for sailors are needed in a hurry. About ten weeks has been the average time consumed in the development of the raw stuff into material ready for embarkation, of which the first three weeks are spent in detention, physical and social quarantine for sanitary treatment and medical observation.

The life is very much the same as that of men training for the army, except that there is no trench maneuvering.

The boys live in tents. Great Lakes Station was built to take care of 1,800 cadets, as a permanent barracks. Today there are about 20,000 there, most of them living in conical or pyramidal tents on leased acreage adjoining the main reservation. The existence is not extraordinarily rigorous or trying. The week-end leaves are liberal after the detention period, there is much baseball playing, boxing, wrestling, swim-

ming, and leisure. There are thirty baseball teams, playing daily matches on league schedules. Every Thursday afternoon there are boxing contests in which weight-matched youths, selected by elimination battles in their own crews, meet to fight it out for the honor or glory of their respective contingents. I saw a neat little knockout in less than two rounds, to the great glee and prodigal applause of about 5,000 observers, among them many women. The food is beyond faultfinding, plentiful and wholesome. The moral barricades about the camp are impenetrable.

It is almost grotesque to see the squads take their naval training on the grass. A battleship is scattered over about a square mile of neatly mowed prairies, in sections and bits—that is, it is in improvised imitations of portions of a ship, some of them crude in aspect and comical in their application to the parallel paraphernalia of vessels.

CAPTAIN WM. A. MOFFETT
Commandant at the Great Lakes Naval Training Station

Here are stretched two long cables, from which are strung a hundred or more bits of loose rope. The instructor stands between the two cables and demonstrates as the students, one at each rope, rehearse the endless varieties of knots, each denominated in seagoing language, including the "bosun's eye," the "monkey's fist," the "devil's elbow," the "Chinaman's clutch," and some even less delicate in allusion.

When the tyro's fingers are red and swollen and studded with rope slivers, the class moves over to a steering platform where a naval compass has been rigged, as is the rule, in the center of the thing, behind which is the regulation steering wheel, attached with hemp ropes to a drum below, which whips the platform about something as an equal pressure and similar manipulation might swerve a ship, I am assured. Therefrom they proceed to another land apparatus, this one representing bulwarks, davits and a lifeboat. Exercises follow in letting down the boat, and so forth.

So they go through it all, from boarding and filing up and down the companionways to easing into sailors' canvas hammocks and swabbing make-believe quarter-decks.

Target shooting with small arms and long-range ordnance is taught and demonstrated much as it is for army work, except that there is a technical difference in that the practice is more specially applied to navy tactics.

Gymnasium drills are obligatory, tank baths are required, some form of outdoor athletic activity is enforced for each man.

Beyond that and the morning class lectures and light evening studies—two hours of class and an hour of study—there is little to do in the being-made of a U. S. tar.

John Philip Sousa, appointed and commissioned a lieutenant for the purpose, drills and conducts the marine band at Great Lakes. He also helps get the name of the station and its works mentioned in print, which is no mean service, as Captain Moffett believes in floating his recruiting on a sea of ink. Captain Moffett has made a record in the work which established a standard held up to many other naval institutions as a criterion. He is an old salt

at the training business. In times of peace it was his duty to keep alive and stirring the perennial need for filling the ranks of the navy, no weak man's task when there is no sensational patriotism on the breezes.

In those days the training life of a seaman was a dream. He lived in government hotels surrounded by as handsome and commodious a set of grounds as the finest resort on any lake shore could show; he was pampered and entertained; his course was a pleasantly lazy yet amusingly active one; he remained long in his preliminaries—being known then as a "naval reserve"—and fed like a traveling salesman.

MRS. WM. A. MOFFETT
Whose Activities at the Station Keep Her as Busy as the Captain

But today he is grabbed and whisked through an emergency short-term system, for there is now more than the maintenance of departmental pride and governmental tables for him to support. And Captain Moffett has risen like a combination hero and business man to the swollen demands, so far beyond the normal capacity of his plant, so much more hectic than the normal routine of accustomed operations.

He is probably the busiest man in America.

He arises at 4:30 o'clock every morning and covers every corner of the camp before reveille, looking to physical equipment, conditions of quarters, and the like. By six he is in his office, dictating. Thereafter, all day long, he works four relays of stenographer-typists (enlisted men), so that by about seven he has three of them transcribing while he is dictating to the fourth, and so on in a four-spoke wheel. Departmental red tape makes an enormous amount of letter writing obligatory, besides which he answers personally every inquiry sent him by the relatives of the men; by prospective recruits or those interested in them; by parents or guardians who have lost their boys and think they may have gone into the navy; by newspapers and magazines seeking official information; by business houses that deal with the camp, and by the training inmates.

The last mentioned item touches one of his motive passions. He insists on himself investigating and straightening out every complaint, murmur, criticism, suggestion or difficulty of any of the thousands of his charges. Between nine and noon and between two and 5:30 he is stormed with visitors, paralleling in person the missions of the writers enumerated above. He sees as many of them as he can. Of his noon luncheon he makes a general officers' mess and daily conference board, taking up over the midday food the myriad issues that must be digested and decided where thousands of volunteers are involved; where a great national duty is to be performed posthaste; where originality and high efficiency are demanded, but where printed and arbitrary regulations must be obeyed.

He has four offices, one back of the other. He stands and fights with the work in hand as long as he can in each successive one, like a soldier defending a line of trenches, and by dinner time has been driven into the last resort, airtight, bombproof, a padded cell with a bolted door in which there is no telephone, no telegraph, and no room for

A Modern "Tank" is Used in the Training at the Great Lakes. If Necessary to Use Seamen as Land Forces at Any Time, They will Be Thoroughly Familiar with the Equipment Used on Terra Firma

any other person. There he toils till late into each night.

Mrs. Moffett, a big, hearty, genial woman, though bearing no official authority, helps him in many substantial capacities. She is mother to the 20,000, and, having so long been the mistress of the naval cantonment, she is an informal authority on naval training law, systems, and customs. Next to seeing the captain himself, one can get sure-fire results by a few minutes with Mrs. Moffett—and an inspiration in practical intensive patriotism, good nature under fire, and optimistic faith in American timber, thrown in.

This may sound as though it were inconsequential detail. But into and through Great Lakes must go about five-eighths of the men—of all the men in all the United States—who respond to the naval call sounded on declaration of the war against Germany.

And the character of the training institution is one of the preponderant and vital things that determine volunteer recruiting. Every sailor is a volunteer. There is no conscription for the navy.

And Great Lakes is an institution of such clean and wholesome and reputable standing in the immediate community, where it is best known, that hundreds of mothers chose the navy for their sons in preference to the other fighting branches, in the face of the frenzied appeals for those other branches, because they knew that Great Lakes was a clean and Christian, orderly and sane, businesslike and beautiful, and manifestly meritorious establishment. And Captain Moffett is looked to to preserve its honor, its usefulness, and its character as fully, or more so, as we put faith in the integrity of a bank or business house because of the known qualities of its management.

It is a serious thing for parents to trust their sons' health, morals, influences, and lives to even their own government. We cry aloud for recruits in all our services, and it is a grand, patriotic, general campaign. But to each mother the going of her boy is no atom in a public episode. He is not one of many. He is her boy. And she will scrutinize every element that he is to encounter; she will not be ashamed or too indolent to ask questions—many. One would be amazed, even in the expectancy of this spirit, to hear the

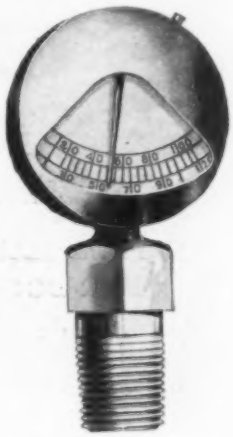
infinitesimal points touched upon in the queries of these guardians and doting ones about what their flesh and blood is to experience in the altruistic and noble function of serving the flag.

Therefore Captain Moffett, who has done all that could be done and more than could be decently asked toward comforting relatives, making recruiting comparatively painless and giving assurances of comfort and heart's ease, has accomplished a fine, monumental work. He has succeeded in dissipating a libelous but stubborn superstition that the navy was a reformatory for wayward boys. He has lent dignity to the navy, helped mightily to fill its ranks without need of involuntary enlistment, and has given to a sailors' camp the atmosphere of a college campus. If this is not heroic, it is at least effective.

¶ Because of the high percentage of cellulose contained in them, a French horticulturist has proposed to use spinach stems in the manufacture of paper.

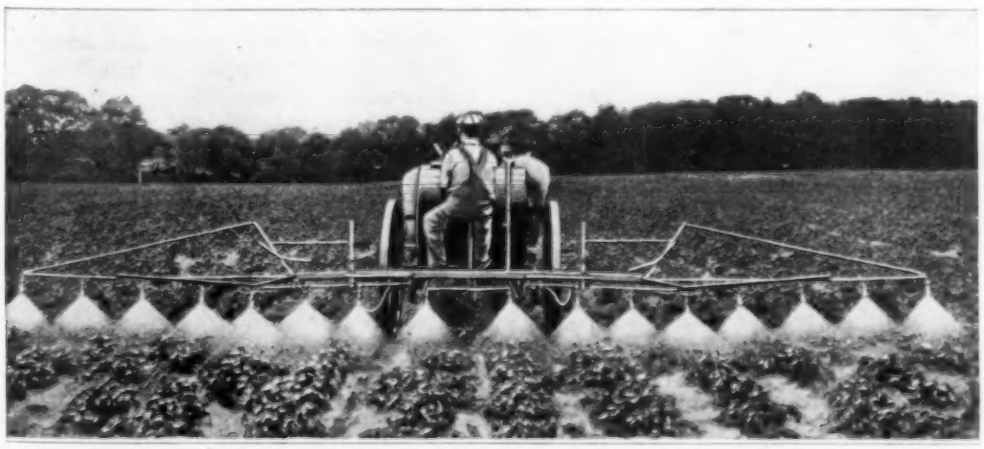
DUAL PURPOSES ARE SERVED BY MOTORIST'S AIR GAUGE

For measuring the compression of engine cylinders, and also for determining the pressure of a tire, a combination gauge has been devised that should be of convenience to the motorist. A spark plug is removed, the gauge screwed in its place, and the motor turned over when a cylinder is to be tested. Fourteen and seven-tenths is added to the dial reading to ascertain the total compression. In this way trouble is quickly located. The method of using the device as a tire gauge is obvious.

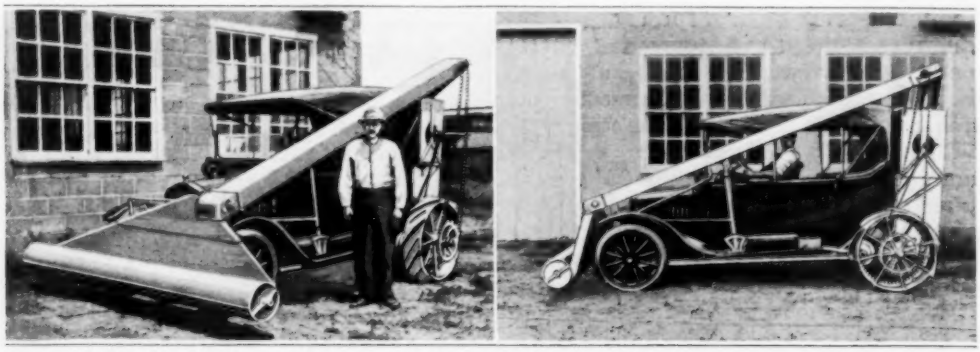


OUTFIT SPRAYS MANY ACRES OF POTATOES IN DAY

Ten rows of potatoes are sprayed in one operation with an outfit that has been developed for large acreages. The machine is horse-drawn and mounts a 100-gal. tank, a small gasoline motor, and at the rear, folding arms that carry 16 nozzles. Its operation, even to the folding of the booms to permit passage through a gateway, is controlled from the driver's seat. The wheels are adjustable to either 60 or 75-in. treads.



Showing the Sprayer at Work in a Large Potato Field: The Mixture is Pumped to the Nozzles under Pressure by a Gasoline Motor



A Front View, Showing the Arrangement of the Cutting Apparatus, is Given at the Left, While at the Right the General Character of the Attachment, When Applied to a Light Car, is Indicated

HELPFUL HAND REST MADE FOR BOOKKEEPERS

One of the new appliances for the business office is intended to overcome the difficulty experienced by bookkeepers, and others, when making entries at the bottom of a ledger which is considerably higher than the surface of the desk on which it is opened. Roughly, the arrangement consists of an adjustable rest that forms an extension to a book and offers a place on which to poise the hand while writing on the lower part of a page. It has a swivel mounting, such as that of a piano stool, and is held by a block terminating in a thin board that fits beneath a record book, the block being flush with the margin of a desk.

With the Arm Rest in Place, It Is Easy to Make Entries at the Bottom of a Ledger

HARVESTER OUTFIT BUILT AS MOTOR ATTACHMENT

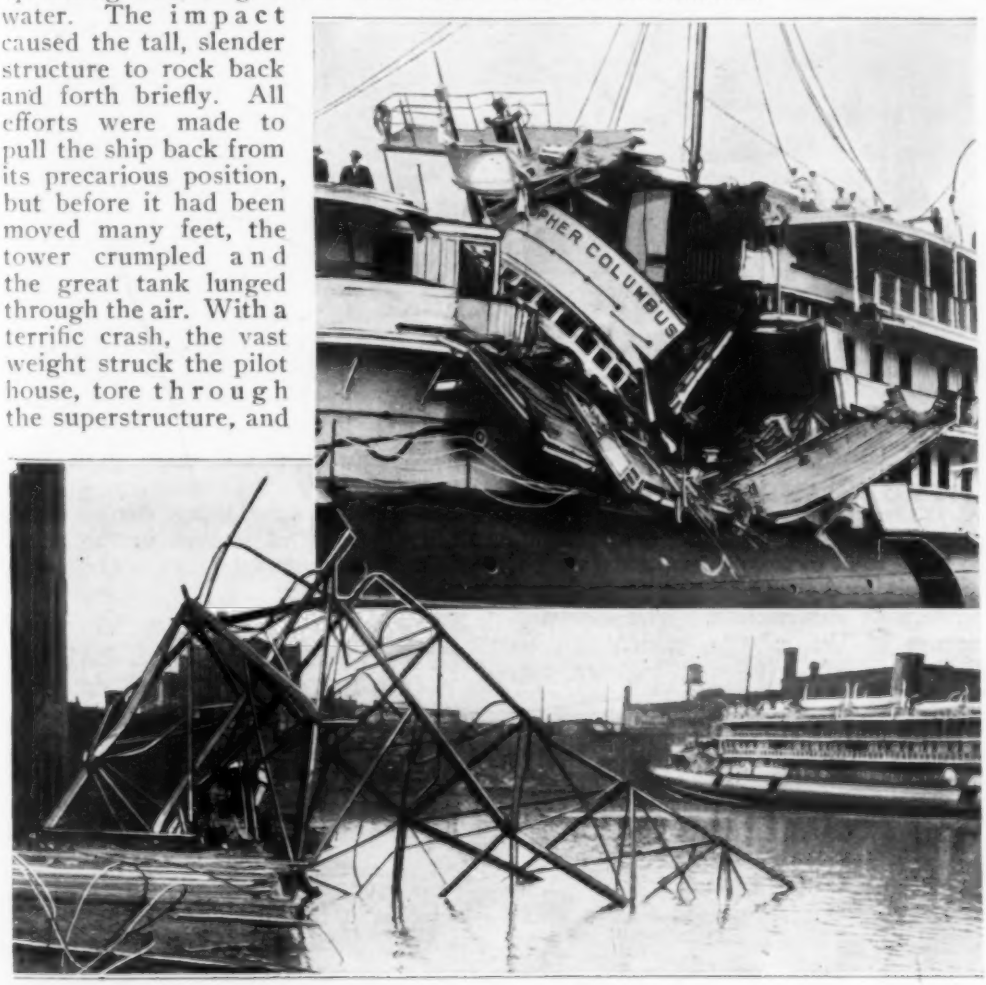
Another invention that contemplates the utilization of the farmer's motor car has made its appearance. This time it is a harvesting and threshing attachment. It can be quickly installed on almost any light automobile, and is claimed to have performed satisfactorily during recent tests in western fields. The cutting apparatus, supported at the front, is adjustable, for instead of operating in the usual manner, it severs the heads of the grain from the straw, which it leaves standing. As this is done, revolving blades throw the material back so that it is caught by the conveyor and carried to the threshing compartment at the rear of the car. The aim of the inventor apparently is to provide a low-priced apparatus that will serve the average farmer's needs and render him largely independent of outside help during the harvesting season. To attach the implement to an automobile it is only necessary to remove the rear wheels, replacing them with the bull wheels.

¶The work of repairing German and Austrian vessels, which have been taken over or purchased since the war began, is progressing rapidly on both the east and west coasts. Some vessels have already been made ready and assigned to the governments of Russia, France, and Italy under special agreements.

MANY KILLED WHEN VESSEL IS HIT BY FALLING TANK

Sixteen lake excursionists were killed and many others injured when the whaleback steamer "Christopher Columbus," a relic of Chicago World's Fair days, met with a strange accident at Milwaukee recently. With its decks comfortably filled with passengers, the vessel, in charge of tugs, was about to pass a bascule bridge spanning the Milwaukee River when something went wrong and the prow of the steamer swung shoreward, crashing against one of the steel supports of a 100-ft. tower upholding a 25,000-gal. tank filled with water. The impact caused the tall, slender structure to rock back and forth briefly. All efforts were made to pull the ship back from its precarious position, but before it had been moved many feet, the tower crumpled and the great tank lunged through the air. With a terrific crash, the vast weight struck the pilot house, tore through the superstructure, and crushed to death those in its path. The decks and staterooms were flooded. Had the tank fallen immediately, it would have hit the vessel amidships, probably causing greater loss of life, for most of the passengers were congregated there.

¶ While on its remarkable run from the Pacific to the Atlantic, recently, the destroyer "Shaw" established a record by passing through Panama Canal in 5 hr. 45 min. The best previous time was 6 hr. 20 minutes.



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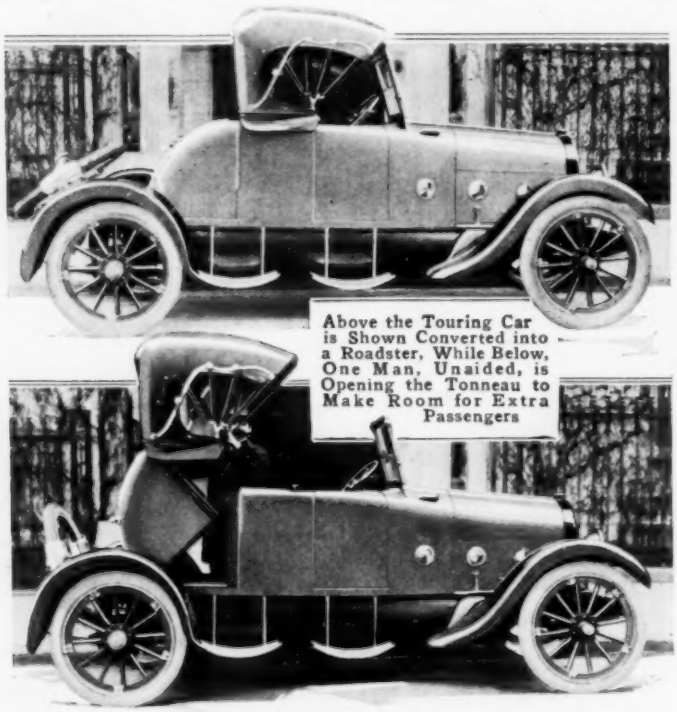
Some of the Damage Done to the Excursion Boat by the Terrific Impact, is Shown in the Picture at the Right. Below, the Twisted Débris of the Overturned Tower is Seen

FOLDING MOTOR-CAR BODY MAKES TWO CARS OF ONE

Those devotees of motoring who desire a roadster one minute and a touring car the next, but for financial or other reasons content themselves with one machine, may now satisfy their whims. A convertible body for the automobile has been developed that makes one motor serve as two. By folding the rear section, an action that requires but two minutes, a five or seven-passenger car is changed into an attractive-looking roadster. By reversing this operation, a "single seater" becomes a big, graceful, foreign-appearing touring car, spacious enough for the whole family. The body has only lately been announced. It can be built to fit any chassis from that of a popular-priced light car, to those of expensive models with long wheelbases.



Above the Touring Car is Shown Converted into a Roadster, While Below, One Man, Unaided, is Opening the Tonneau to Make Room for Extra Passengers

NEW PROJECTILE RELEASES SMOKE AND LIQUID FIRE

A new high-explosive shell is about to be offered to the government, which, it is claimed, possesses extraordinary powers of destruction. The essential nature of the missile, which can be made for both rifle and big-gun use, has been revealed to only a few by the inventor, but it is stated that a shell of this type can be made to carry as far as 26 miles and that on striking its objective several scores of units explode. A destructive liquid fire is released against the enemy by part of the projectile, while another portion gives off an enveloping dense black smoke. A spiral groove in the shell, which is of unusual length, gives it a swirling motion.

Recently Invented High-Explosive Shell: Missiles of This Type, on Exploding, Give Off a Destructive Liquid Fire and an Enveloping Cloud of Smoke

SHEEP-KILLING DOGS CAUSE OF ENORMOUS WASTE

At this time, when meat and wool are two of the world's most vital necessities, it is well to turn attention to one of the chief causes of our shortage. The Department of Agriculture sponsors the assertion that the sheep-killing dog is the principal cause of the marked decrease in the number of sheep kept on American farms. Most of us love a good dog, but few persons, once they understood the situation, would willingly give unrestricted freedom to an

This Photograph Shows What Happened in One Night When Two Dogs Attacked a Flock of Sheep. They Killed 50 Animals That Were in the Pink of Condition

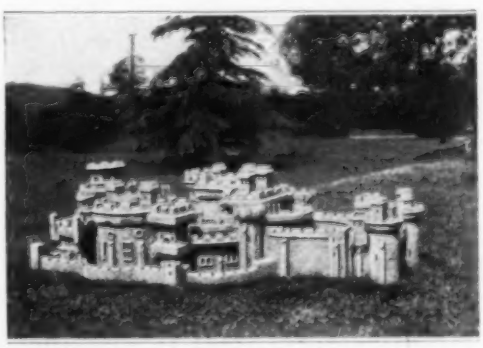
animal that in a night's time might slaughter an entire flock of sheep. The government and various organizations are urging that every rural owner of a dog awaken to the situation and take steps to prevent this enormous economic waste.

UNIVERSITY COMMENCEMENT HELD AT ARMY POST

Sixty-six seniors of the University of Wisconsin participated in unusual graduation exercises late in June when, clad in khaki as members of the reserve officers' training camp at Fort Sheridan, Ill., they were handed their "sheepskins" in the big gymnasium at the army post. Because the men were unable to obtain leaves which would permit them to attend commencement at Madison, the university came to them. The diplomas were distributed by the dean of the men's department, whose address on the occasion was unusual, as befitted the military character of the ceremony. The incident is unique in the history of the institution.

WOODEN MODEL OF CASTLE BUILT BY YOUNG WOMAN

A model of a castle, measuring 4½ by 5 ft., and composed of 2,000 pieces of wood, has recently been constructed by a young woman who spent three months on the task. The walls, towers, battlements, guarded gateway, bartizans, etc., have all been painstakingly reproduced. The finish of the miniature gives it the appearance of stone. It is to be used as a novel electric-light fixture for a large residence.



Model of a Castle Which Measures Four and One-Half by Five Feet, and is Composed of 2,000 Pieces of Wood

RAISE CONCRETE MONUMENT FOR FORMER FIGHTERS

In memory of the soldiers buried in one part of a cemetery at Kinsley, Kans., a monument, paid for by popular subscription, has been erected. One of the interesting things about it is that it is built entirely of reinforced concrete. Bas-relief panels ornament the sides of the square pedestal, which is surmounted by four figures representing the infantry, cavalry, artillery, and navy. A statue of "Winged Victory" crowns the monument. Each of the five figures are free-hand modelings in concrete over iron frames.

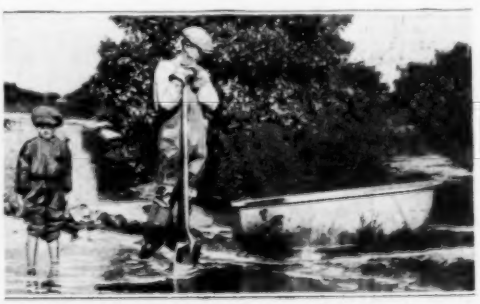
The Figures and Panels on the Memorial Are Free-Hand Modelings in Concrete

MANY WAR-PLANT WORKERS POISONED BY GASES

As a result of an investigation conducted under the direction of the Federal Bureau of Labor Statistics, disclosure has been made that an enormous number of American workers engaged in the production of explosives are succumbing to industrial poisoning. It has been found impossible to obtain accurate figures showing the complete number of cases of sickness and death caused by the work in this country since the opening of the world war. Many cases, it seems, have failed to be recognized, while on the other hand many company and insurance physicians have shown unwillingness to divulge what they know. Solely upon doctors' reports, however, it has been discovered that during a period of about one year, 2,507 known cases of poisoning occurred among workers in 28 plants. Of this number 53 proved fatal. About 55 per cent of the illness and 53 per cent of the deaths, were caused by nitrogen oxides and nitric acid. Most of the victims who suffered from these fumes were employed in making nitrocellulose, picric acid, nitroglycerin, and associated nitrogen products.

HOMEMADE METAL TAPPOON OF CONVENIENT TYPE

A durable and convenient type of tappoon illustrated herewith consists of a piece of heavy sheet iron, cut with one straight edge and with the other edge curved to conform to the bed of the irrigation ditch into which it may be inserted to serve as a temporary dam. Handles are provided so that it can be carried from place to place easily and employed in diverting water into the fields as the occasion may require.



At the Right in This Illustration is Shown a Homemade Tappoon of Sheet Iron Provided with Handles so That It can be Moved About Easily

FOR GOOD COLOR: SALT WATER AND SUNSHINE

The Stock Market can "Go Bunch," and So Can Tea Dances and Summer Fiction When the Water Is Warm and There Are "Sea Horses" to be Ridden. "Sea Horses," Incidentally, Are Not Ferocious, but Merely Capricious, and a Bit Balky When the Waves Are Choppy. An Intimate View of One, with a Fair Rider, is Shown at the Left, While Above Many are to be Seen in the Water

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A Toboggan for Salt-Water Coasting Gives Some of the Thrills That Make the Snow Slides of the North so Fascinating

Loaded with Tanned "Huskies" Who Are as Much at Home in the Water as Chorus Girls Are on the Stage, the Life-Savers' Beach Car at a Popular Bathing Resort: The Machine Carries Complete Apparatus for Resuscitating Those Who Have Unfortunate Mishaps in the Water

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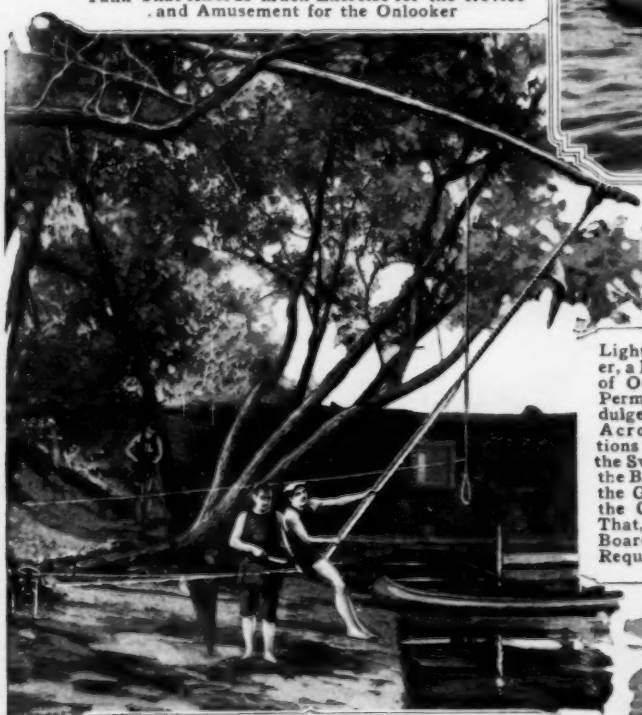
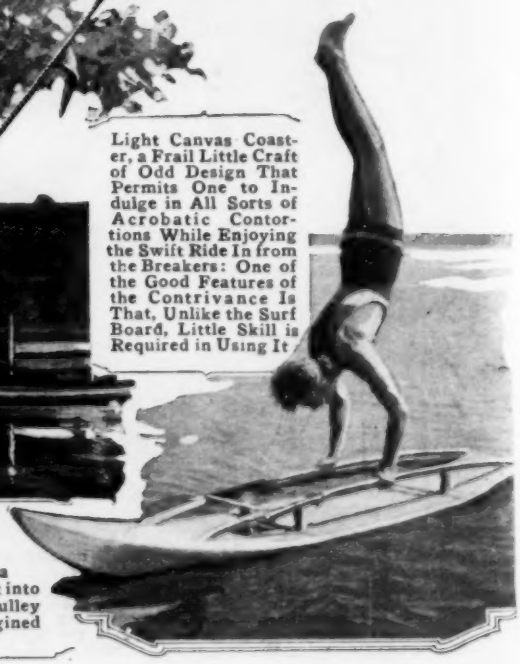
Hula Maids, Ukuleles, and Surf Boards Are Three of the Things That have Made Hawaii Famous. This Picture Shows Two of the Latter and Their Mistresses on the Sands at Honolulu

IN THE SURF, WHERE CARES ARE WASHED AWAY

Crowds of Pleasure Seekers Watching Swimming and Diving Contests in a Large Open-Air Tank at a Popular Resort: For Those Who Prefer the Surf, There Is a Beautiful Beach That at Low Tide Accommodates Hundreds of Bathers and "Sand Waders." During the Tourist Season, This Is One of the Gay Spots Where the Spirit of Recreation Runs Riot. The Picture at the Right Shows Bathers Riding a "Torpedo," a Cylindrical Tank That Affords Much Exercise for the Novice and Amusement for the Onlooker

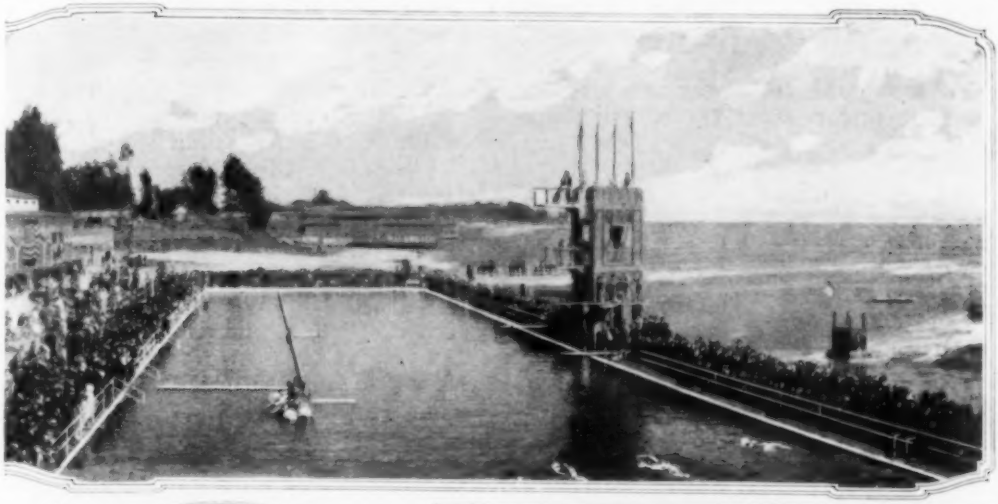


Light Canvas Coaster, a Frail Little Craft of Odd Design That Permits One to Indulge in All Sorts of Acrobatic Contortions While Enjoying the Swift Ride In from the Breakers: One of the Good Features of the Contrivance Is That, Unlike the Surf Board, Little Skill is Required in Using It



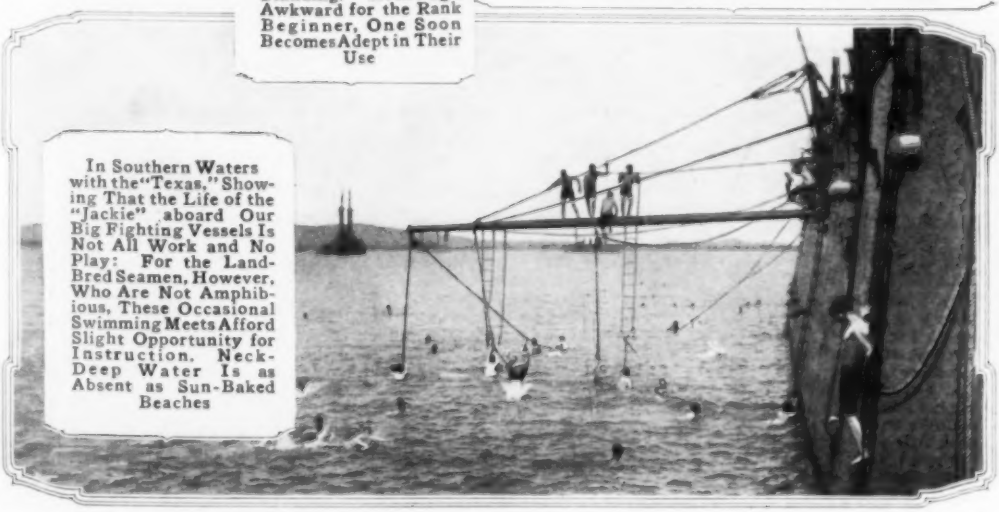
Putting a New Thrill into the Old Swimming Hole: The Catapult, Made by Fastening the Inner Tube of an Automobile Tire to a Horizontal Pole, Throws the Bathers Far Out into the Water. To Stretch the Sling, a Rope and Pulley are Used. The Exhilaration can be Imagined

AND YOUTH IS MERELY ONE'S POINT OF VIEW



Above, a Group of Water Devotees are Enjoying the Novel Sport Provided by the "Hydroskis," in Which They are Standing. Although Awkward for the Rank Beginner, One Soon Becomes Adept in Their Use

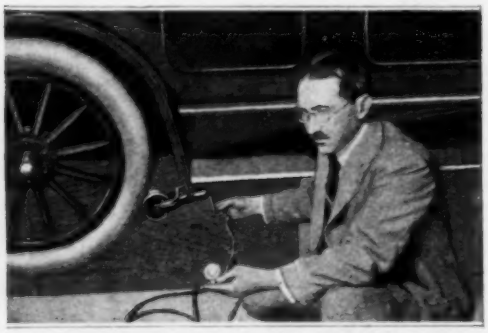
Glimpse of a Favorite Beach at Night, the Water Illumined by the Glare of a Great Battery of Searchlights Situated at the End of the Pier, Which Extends Out into the Water for a Mile. The Rays of the Projectors Are Visible at Points 40 Miles Inland



In Southern Waters with the "Texas," Showing That the Life of the "Jackie" aboard Our Big Fighting Vessels Is Not All Work and No Play: For the Land-Bred Seamen, However, Who Are Not Amphibious, These Occasional Swimming Meets Afford Slight Opportunity for Instruction. Neck-Deep Water Is as Absent as Sun-Baked Beaches

TIRE-FILLING PUMP DRIVEN BY REAR WHEEL OF CAR

Among the motor-car accessories of recent introduction there is a power-driven tire pump of simple, yet novel, character. It is a compact contrivance, which is fitted, when in use, to either of two brackets fastened at the rear end of the running boards. When thus mounted, a pulley, which is a part of the instrument, is held in frictional contact with one of the back tires. By jacking up the wheel adjacent to the pump, and starting the engine, air is supplied. In case one of the rear tires is to be inflated, it will be understood that the pump must be attached in front of the opposite one. Tubing of sufficient length to reach either of the front wheels is provided, and connected to it is a pressure gauge. When not in use, the pump is carried in the tool box.

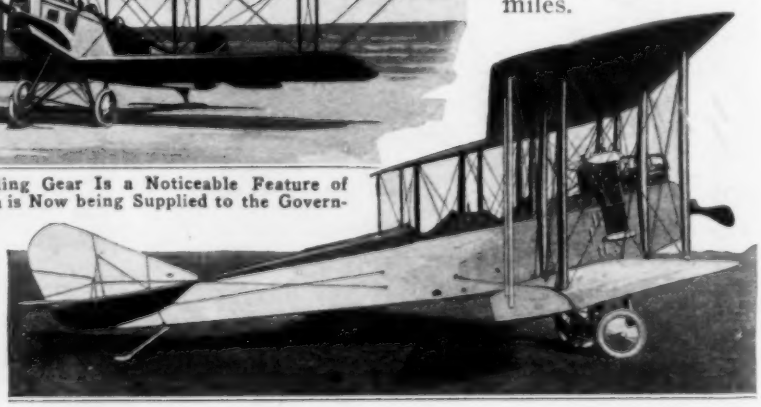


Demonstrating the Method of Attaching the Pump to a Car and Operating It

INCORPORATE NEW FEATURES IN LATE AIRPLANE MODELS

Some attractive refinements are embodied in two late models of air craft produced by the Standard Aero Corporation for our army fliers. A three-wheel running gear, for instance, is used on a preliminary training machine, a tractor of sturdy construction built to withstand the hard usage to which instruction planes are subjected. Beginners usually require considerable practice before they master the knack of straightening a craft out, a few feet above the ground, so that it settles onto the landing gear gracefully. In case this machine encounters the earth at too sharp an angle, the forward wheel tends to throw it back onto those behind. Thus the craft might readily be prevented from digging its nose into the ground. With a full load the range of speed is from 37 to 68 miles an hour.

Ailerons on the upper and lower planes of the military reconnaissance tractor are connected by struts. This unusual practice has been adopted to facilitate control and increase stanchness. The wing spread of both planes is an inch in excess of 40 ft. A 125-hp. motor gives the craft a maximum speed of 87 miles an hour, and its range of action is about 600 miles.



The Three-Wheel Landing Gear Is a Noticeable Feature of This New Biplane, Which is Now being Supplied to the Government for Use as a Preliminary Training Machine at Various Aviation Camps. Right: Military Reconnaissance Tractor with Ailerons on Upper and Lower Planes Connected by Struts to Increase Stanchness and Aid Control

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Above and at the Right Are Views of the Wrecked Cars Which were Hurled from a Brooklyn "L" Structure to the Street as a Result of a Collision

"L" CARS PLUNGE TO STREET WITHOUT FATAL RESULTS

Although several persons were injured, no one was killed when two cars of a Brooklyn elevated train recently left the track and plunged many feet to the pavement. The accident, which was a most remarkable one, occurred when a three-car train crashed into a string of empty carriers that were being switched from the express to the local tracks. The impact of the collision sent the lead car, which carried about 20 persons, crashing to the street. The second car plunged headlong to the sidewalk, and remained in a diagonal position, one end against the walk and the other resting on one edge of the "L" structure. Passengers in this carrier were catapulted to the lower end and half buried beneath loosened seat cushions. To make matters worse, fire broke out.

¶Our navy's new destroyer "Shaw" made a record run from the Pacific coast, where it was constructed, to an Atlantic port, recently, when it covered a distance of 5,858 miles in 14 days 10 hr. 20 minutes.

BIG TRAVELING SPRINKLER FOR EXTENSIVE GROUNDS

Large lawns, golf and bowling greens, and grass tennis courts are watered thoroughly and without requiring more than casual attention, by

Moving Slowly in a Circular Path, a Sprinkler of This Type, Consisting of Three Connected Units Like That Shown, can Distribute Water over an Area of More than 1,400 Square Yards

a self-propelled sprinkler that travels slowly in a circular path. It is provided with a stationary base at one end and consists of a pipe mounting three wheels and supporting a similar number of revolving sprays. The force of the water drives gears which in turn move the whole apparatus. When fed with a ¾-in. hose in which the pressure ranges between 50 and 60 lb., the contrivance is able to throw water over a circular area 130 ft. in diameter. It is equipped with an automatic controller which, when set, stops the sprinkler and shuts off the water after one revolution has been completed.

MICRO-MEGAPHONES PROTECT QUAKER CITY

Measures to protect historic Independence Hall, in which the Declaration of Independence was signed, and

One of the Huge Micro-Megaphones Installed at the City Hall, Philadelphia, Which will Warn the Quaker City, should Hostile Air Craft Approach

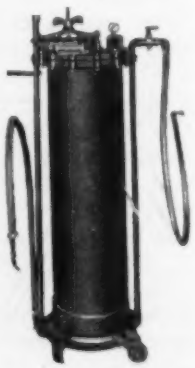
which houses today America's most loved and valued memento — the Liberty Bell—from any possible raid by hostile airplanes, have already been taken by Philadelphia. On the roof of the city hall, 300 ft. above the street, two powerful micro-megaphones, which will record the feeblest air sounds for many miles around the city, have been erected, and a third is installed on another building. However faint the whirl of the propellers of an air machine, it will be intensified by the instruments to audible sounds, so that warnings may be flashed to the Philadelphia Navy Yard and elsewhere.

The instruments are patterned after the micro-megaphones used in France and England, but have been improved upon by the chief of Philadelphia's electrical bureau so that they have greater range. Attached to the micro-mechanism, or sound intensifier, at the smaller end, are telephone wires leading to several places in the buildings where are operators with ordinary telephone receivers at their ears.

Each instrument is about 11 ft. long, has a diameter of 5 ft. at the mouth, yet weighs only 150 lb.; they are mounted on swivel supports so that they can be turned to any point of the compass rapidly.

AUTOMATIC DOUBLE-BARREL GREASE AND OIL GUN

A novelty for the garage is a double-barreled grease and oil gun of 100-lb. capacity, which works under forced air pressure, being charged with air like an auto tire. It literally shoots grease or oil into the lubricating systems of automobiles and at the same time measures it by the pound or the pint, showing the quantity upon the dial of a gauge. The gun has a double chamber and will handle 40 lb. of gear grease and 8½ gal. of oil, dispensing one or both kinds at the same time.



When There Is Rough Carpentering to be Done, This Capable Fellow does Not Let the Work Fall to Some One More Fortunately Equipped for It: He Does It Himself, and Does It Well

Filling His Pipe: Many Men can't Light a Pipe in the Wind. This Man Does It without Hands

Whether It Is a Shovel or a Pencil, Joe Glasgow Makes Use of It if Called Upon to Do So. Many of These Things He could Accomplish More Easily with Artificial Hands, but Lacking Those Also, He Makes the Best of His Stumps and doesn't Complain about It Either

WHAT A MAN CAN DO WITHOUT HANDS

WHAT would you do if, instead of hands, you had two scarred stubs terminating halfway between the elbows and the place where hands ought to be? What you might do, if you had the courage and persistence, is demonstrated in the case of Joe Glasgow, a teamster and all-round handy man employed by the city of Venice, Calif. When you see this man sauntering into the city yards after lunch, with the air of one well satisfied with life, it is hard to realize his affliction.

Seven years ago, Glasgow, possessed of two good hands, was working as a fireman on a railroad in Michigan. One day there was a collision. The engineer was killed. Glasgow was taken to the hospital, and when he regained consciousness he found that both hands were gone. After leaving the hospital he took up what seemed, for him, the only occupation left, and for two years he stood on the street corners and begged. The occupation paid well but it did not satisfy him. He wanted the standing among men that he had had before his accident, and he started in learning to work with his stubs.

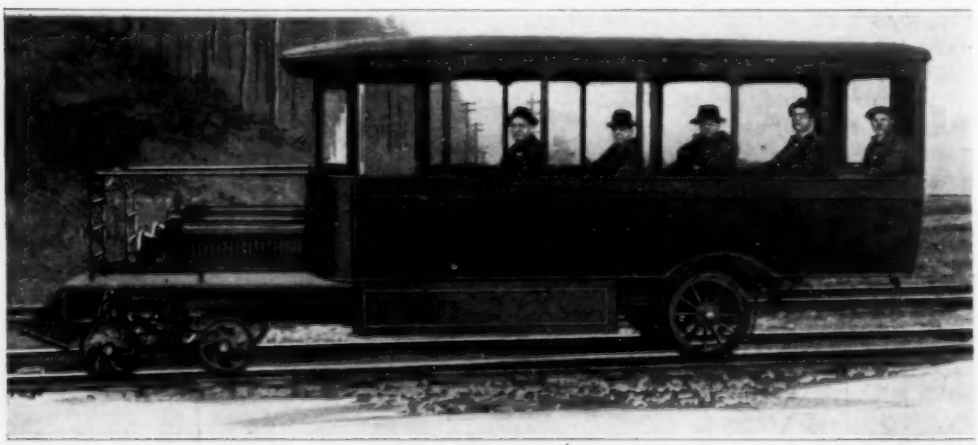
Now he holds down a job as a teamster, and holds it down so well that a recent attempt to oust him from the city's service, in order to provide a job for a man with two hands and a motor truck, failed. He harnesses and drives his own horse, doing all the loading and unloading without help. When the teaming work is dull he works with shovel or saw or at some of the numerous odd jobs to be done about the city

Anyone can Drive a Horse, or at Least Make a Stagger at It, but It Isn't Everyone Who can Harness One. Here Is a Man, a Teamster, Who, in Some Strange Manner, Does Both of These Things without Hands

yards. When pay day comes, he writes his name on the back of his check legibly and easily. Once a week he writes "with his own hand" a letter to his mother, whom he supports. He fills and lights his pipe and takes money out of his pocket as readily as do men with two hands. He does these things without hooks or other mechanical aids.

When he came to Venice four years ago it looked as if the city had acquired a new public charge. Glasgow was not long in dispelling this illusion. All he wanted was work, and he started out immediately to find it. A woman telephoned the police station that she wanted a man to mow the lawn and wash windows. They hunted up Glasgow and sent him to the address given. Some time later an indignant woman called up and said she hadn't asked for a cripple—that she wanted an able-bodied man who could work. "Why not give him a chance?" was the suggestion made by the man at the desk. She did, and the way he did the work established him permanently in that neighborhood as a handy man for odd jobs. Later, he went into the express business, buying his horse and wagon with money he had earned. Six months ago there was an opening for a teamster at the city yards. He went after the job and got it. On several occasions he has had to fight, and on each occasion this was because some misguided person assumed that he would be compelled to submit to an affront because he was a cripple. Glasgow does not admit that he is a cripple, and the only thing he complains of in the matter of fighting is his limited reach. This compels him to take some severe punishment before he can get close enough to his adversary to bring his stubs into effective action.

How does he do these things? It is necessary to see him to understand, and then it seems unbelievable. If he is going to use a tool he "fumbles" it for an instant, gets it in position between his stubs, and uses it so quickly that you scarcely see how it is done. As you watch him you realize that what other men do as a matter of routine is with him a continual triumph. For this reason, perhaps, he is more efficient and thorough than the general run of workmen—more efficient and thorough, it may be, than he would have been if accident had not robbed him of the thing most essential for working.



GASOLINE PASSENGER CAR ON AN ELECTRIC ROAD

THE roomy gasoline car pictured above makes three return trips daily from Chehalis, Wash., to Onalaska, a lumbering town 16 miles away. It was designed and built for this purpose by a Chehalis concern, and runs over the tracks of a railroad intended for electric service. It is, of course, equipped with flanged wheels, and a special feature is the railed platform built around the automobile engine, above a light four-wheeled truck, with a small cowcatcher of locomotive type in front.

VAST QUANTITY OF SHELLS USED BY ARTILLERY

Although most persons realize that colossal amounts of artillery ammunition are being used daily along the battle fronts of Europe, doubtless few persons have any conception of the actual figures involved. Information of this character has been extracted from General Sixt von Arnim's report of the battle of the Somme in July of last year, according to The Field Artillery Journal. In studying the data, however, it is well to remember that the Germans were on the defensive and lost ground, so that the ammunition expended by them during the period does not even represent the supply needed for a successful defense. The greatest number of projectiles fired in a 24-hour day was 322 rounds for each 3.08-in. field gun, 479 for each 4.20-in. howitzer, 233 for each 6-in. howitzer, 321 for each 4.2-in. gun, and 116 for each 8.4-in. mortar. The daily average for each piece was: 3.08 in., 145 rounds; 4.20 in., 170 rounds; 6 in., 119 rounds; 4.2 in., 118 rounds, and 8.4 in., 51 rounds. Exclusive of heavy pieces, one field gun was placed about every 20 yards along the entire 40 mile front. This would indicate that German 3.08-in. guns fired a total of about 15,732,500 projectiles weighing 121,140.25 tons during the month.

STRONG COT FOR CAMPERS FOLDS UP COMPACTLY

A particularly serviceable folding cot is now being used for motorists and campers which can be rolled into a package as long as the opened cot is wide and only a few inches in diameter. The canvas top is supported by four pairs of folding legs which are braced in such a manner that the article does not tend to collapse when weight is placed upon it. The cot can be set up in a minute's time and knocked down even more quickly. It possesses obvious advantages because of its light weight and the small space it occupies when folded.

A Strong Comfortable Cot for Campers and Motorists: It is So Constructed That When Occupied, as Shown in the Lower View, It does Not Tend to Collapse. The Compactness of the Article When Folded is Shown in the Upper View

SABADILLA SEEDS USED IN MAKING WAR GAS

A recent report issued by the Smithsonian Institution calls attention to the unusual properties of sabadilla, a Venezuelan plant from the seeds of which were produced some of the asphyxiating and tear-producing gases used by the Germans. It is reported that they bought up all the available supply before the declaration of war. Now, however, the seeds have been declared contraband by Great Britain. A plant of the same genus grows wild in Texas and should the need for sabadilla arise it might be cultivated in the South.

BESTIAL RACE RIOT SHAMES HOME STATE

Fleeing, Not from Blood-Drunk Teutons in Belgium, but from Citizens of East St. Louis in Illinois, the Proud State of the Great Emancipator: The Negroes are Shown Rushing into Missouri, a Former Slave State, to Escape Torture and Murder at the Hands of Their Northern "Defenders"

A Glimpse of the "Black Valley" After the Savage Thirst of White Men and Women had been Satisfied: In This District Negroes were Beaten Insensible, Shot in Cold Blood, Hanged, and Burned, Torches were Appliedand More than300 Homes, Inhabited by the Black Population, Razed

While America, in the Interest of Humanity and Justice, has Cast Its Lot with Gallant France and Her Allies for the Avowed Purpose of Crushing German Autocracy and Brutality, Some 2,000 Soldiers were Forced to Garrison East St. Louis to Quiet the Rioting and Enforce Law and Order. Strife Such as This Interferes with Our Prosecution of the War

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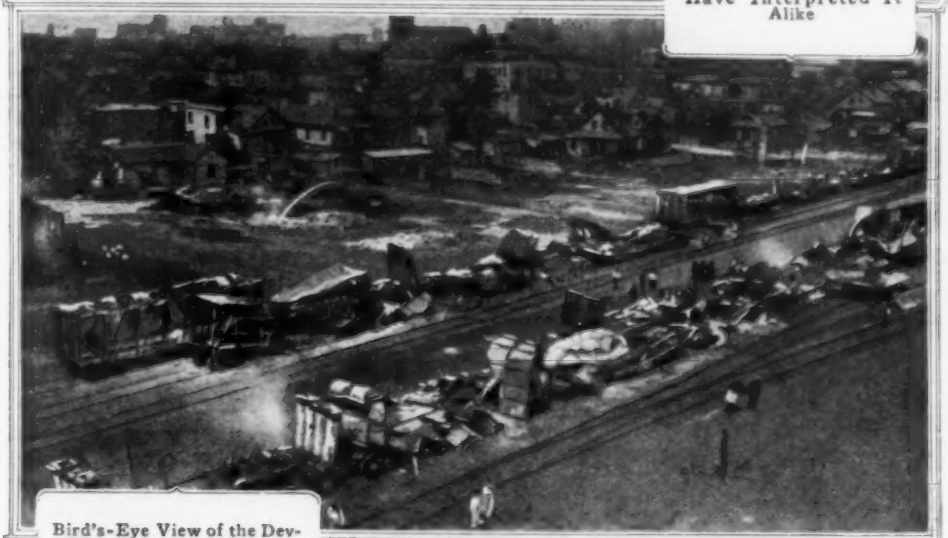
OF LINCOLN ON EVE OF INDEPENDENCE DAY

Flight: A View That Is Remarkable in Its Artistic Qualities and Gripping in Its Portrayal of the Human Element. In the Foreground There Is a Face One should Study. The Girl's Expression Seems Almost Inscrutable. No Two Persons Have Interpreted It Alike



Bird's-Eye View of the Devastated Section of East St. Louis (Which Is Not a Part of St. Louis, Missouri): Several Hundred Thousand Dollars' Worth of Property was Destroyed by the Fire Which Lawless Rioters Kindled. The Outburst Was One of the Most Depraved and Atrocious Massacres That has ever been Enacted in an American City

At the Headquarters of the Red Cross: Refugees Who Escaped the Reign of Terror Seeking Help. During the Disturbances, Negroes were Outraged in Ways Incomprehensible to Those Unfamiliar with Mob Psychology. Even White Women Played Conspicuous Parts in the Loathsome Proceedings

PHOTOS COPYRIGHT INTERNATIONAL FILM SERVICE

POOR ROADS MAKE CARTAGE COSTS ENORMOUS

AS an indication of the high cost of transportation in some parts of Java, it recently cost a tea merchant $141 a mile to have a three-ton flywheel hauled from a village to a plantation, 34 miles distant. The absence of railway facilities and the wretched condition of available highways were responsible for the expense incurred, which amounted to $4,800. The load was carried on two steel trailers specially constructed for the purpose, and was drawn by a pair of heavy motor trucks. Because bridges along the route were not strong enough to support the combined weight of the loaded trailers and the tractors, it was necessary to ford the streams as encountered. Seeing such a caravan for the first time, the natives crowded about it, anxious to have their pictures taken.

LARGE ONE-STORY SCHOOL HAS SPECIAL ADVANTAGES

What is pronounced one of the largest one-story school buildings in New England was completed at Westfield, Mass., some time ago, and covers an area that measures 116 by 182 ft. The school will accommodate nearly 700 pupils and contains an auditorium with seats for 600. A fireproof motion-picture booth is included in the equipment. The only excavation necessary was for the janitor's quarters and for boilers. While the school is not particularly attractive architecturally it has three very practical advantages: It is an economical type of building to erect; it has an especially fine lighting system in that most of the light comes from above as in a studio, and there is very little danger from fire because all the children are on the ground floor.

Unusually Large One-Story School at Westfield, Massachusetts, Which Accommodates Nearly 700 Pupils: Considerations of Economy Were Instrumental in Designing This Type of Building. The Rooms are Lighted Chiefly from Above, Like a Studio

COMMENT AND REVIEW

SCORES of articles which contributed to our comfort or actual needs, have been reaching us for years in steadily increasing quantities. It was so much cheaper or easier to have these things brought in ships, we paid little attention to what might happen to that supply. Of late we have been prospecting our mountains and valleys, plains and ocean beds, and are rapidly bringing to light undreamed of resources. Our factories are already manufacturing articles which three years ago they could not produce. A few instances will suffice to illustrate the widespread effort, and afford great encouragement for the future.

Finding Our Resources

For years our iron furnaces depended on Germany for a certain kind of clay indispensable to their operation. So far as anyone knew there was no clay equally good in this country. A call was sent out and 2,900 samples were sent in. On a supposedly worthless farm in southern Illinois was found a vast deposit of clay even superior to the imported. For months past two steam shovels have been loading into cars this vital commodity, which has proved its ability to withstand several hundred degrees more heat than the imported article.

Chemists' glassware, such as bowls, retorts, etc., has for years all been imported, and largely from Germany. That supply also ceased abruptly. In response to the dire necessities of our chemists, some American glass makers were induced to try their hand with the result that at the end of a year some startling results have been achieved. Not only has our homemade product been brought up to the standard of the articles formerly imported, but is even a great deal better. One industrial chemist who operates a large laboratory ordered a year's supply of the American product. Now, after eight months' use, he finds that at the average rate of breakage the quantity he has been buying every 12 months is going to last 60 months; or five years' life for the American product against one year's life for the foreign.

The same encouraging reports come from many other directions. A scientific measuring instrument requiring very great accuracy, the manufacture of which has never been attempted here, is now made at home with results in every respect equal to the imported article. Whether our ability to do some things quicker than is done abroad will offset the difference in the cost of labor there and here, and so enable our manufacturers to compete after the close of the war, remains to be seen.

The Diamond Match Co. has, at an expenditure of $400,000, erected plants by which for the first time in this country high-grade muriate of potash is now produced in commercial quantities. On account of the higher cost of labor here, its cost is more than that of the formerly imported article.

We have been at a great disadvantage in the matter of dyes. Makers of roofing tile, for instance, refuse to guarantee the lasting colors in red and green tile. Germany had devoted the most critical scientific study to dye making for over 40 years. We had practically neglected both the study and manufacture. While we have not as

yet perfected our processes to the high standard of the German dyes, a great deal of progress has been already made, and new and promising results are constantly being announced. During the years 1915, 1916, and to date in 1917, no less than $189,000,000 has been invested by the companies organized to expand or engage in the making of dyes and chemicals. Results of the most encouraging nature are announced. We already are producing many dyes as good as, or even better than, the imported, and in others of the more difficult processes are making rapid and satisfactory progress. We may fairly claim to have made as much advance in two and one-half years as Germany did in any 10 years; and with the groundwork established here as it is, the next year or two must certainly show even greater advance. The young industrial chemist never before had so promising a future as here and now.

Advertised for Cripples

AN unusual advertisement appeared in a Chicago paper recently, desiring the services of five humpbacked men. The explanation of this strange want is even more interesting than the announcement. It seems that a large envelope factory, unable to fill its orders, decided to work nights as well as days. Long experience had demonstrated that in the use of certain machines women were better operators than men by reason of their hands being more delicate and nimble. The owner does not believe in factory work at night for women, and the men proved clumsy and slow. It was then he set about to seek men who were well, but physically incapable of heavy work. He decided that humpbacks had the necessary qualifications of more agile and sensitive touch, and an actual test proved such to be the fact. Hence the advertisement. The suggestion which this incident offers may doubtless be applied in other lines of work.

Training School for Savings

THE financiers all tell us the saving of money is a habit, natural to a few and something to be acquired by most of us—a most deserving and commendable habit, however, and one which grows with acquaintance. We are inclined in this country to look at things in a large, generous way, and quite apt to despise the day of small things, or the doing of something which seems small in itself. Scarcely a column of any daily paper which does not tell of this or that enterprise the cost of which runs into millions of dollars. The idea of religiously putting away a dollar a week seems small in comparison, so "what's the use?"

There are many also whose false pride prevents them from going to the savings bank with a dollar every week, and who intend to wait until they have accumulated five or ten, in order to deposit something worth while. And so the weeks pass, and there seems no convenient time to part with that much, and the man doesn't save.

While its purpose was not to establish a training school for saving, the Liberty Bond bids fair to accomplish that highly desirable

result. In many establishments where employes subscribed for bonds, it was arranged to have the cashier deduct the weekly installment for the bond from the pay envelope, and remit the bank where the subscription is placed. This not only saves the individual time otherwise spent in going to the bank, but materially reduces clerical work, for which no compensation is received in this case. Already most of those who bought the bonds on the weekly-payment plan have them one-fourth paid for. Soon the payments will be completed and the bond delivered. By that time there will doubtless be another issue of government bonds. If not, the saving habit should be continued at a savings bank. A banker studies money; he knows its value, and realizes the possibilities of its possession. Therefore he respects the man, woman, or child who saves his money, and nothing will be farther from his mind than to regard lightly even the smallest amounts that go into a savings fund.

Everyone should strive to have a bank account, especially every man and boy, be it ever so small. One loses nothing in the esteem of his employer and friends by being seen going into or coming out of a bank. Neither does the individual lose any self-respect by being seen at a bank counter, which is more than can be said of some places. There are plenty of good banks; pick out one and stick to it; and when you are tempted to invest in some alluring get-rich-quick scheme, go to your banker and ask his advice. It will not cost you anything to do this, and may save you a loss you cannot afford.

It may safely be assumed that if this course were pursued by all of us, the money sunk in swindles, fake schemes, and impossible enterprises would be reduced to a point where it actually would not pay to make the attempt. Before investing, ask your banker.

Advertising Saves Vegetable Crop

IN its Committee of Public Safety, the State of Massachusetts has a most efficient organization for securing those things which help to strengthen the country in these days of war. Among the many practical accomplishments was one recently, in which an unusual supply of a perishable garden vegetable was saved from what promised to be a heavy waste. In one locality the oversupply of spinach was several times the normal demand, and the wholesale price dropped from $1.25, a profitable price, to 80 cents, a losing price, per barrel, with a prospective loss of several hundred barrels.

To stimulate demand and save waste, it was suggested the growers advertise the big crop and the low price in consequence. The result was an immediate demand which consumed the excess 1,000 barrels, exhausted the supply, and called for more. While the loss or saving of a thousand barrels of spinach in one community is of comparatively little importance, the results obtained are far from insignificant. The same condition exists once or more often every year, in almost every community. If the growers everywhere would avail themselves of the demonstration made in Massachusetts and advertise their overstocks, the aggregate result in the whole country in one year would run into millions.

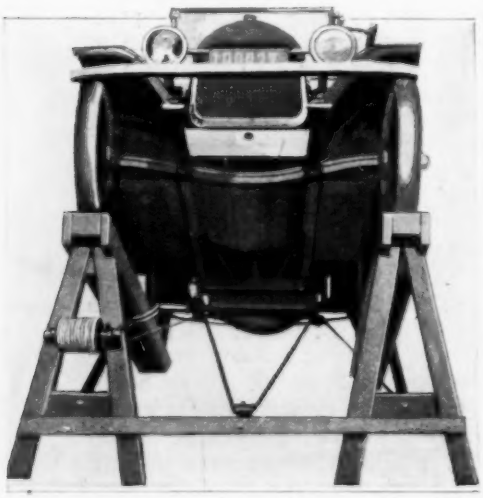
THE vast quantities of steel used in the manufacture of munitions have made a steadily increasing drain upon even the maximum production of our blast furnaces. Plants which had been closed down for years have been rebuilt and are running nights, days, and Sundays. Our machine-building establishments are requiring more than ever before. On every hand the clamor goes up for more steel. This has reduced the supply of raw material to thousands of plants turning out cast iron, and they, too, are feeling the effect of shortage. As an instance of this kind, some of the largest stove foundries have been obliged to cancel contracts and accept orders subject to their ability to secure the iron to put into the stoves. A single order for 10,000 stoves was thus canceled only a few days ago.

Sell Old Iron

Our habit of throwing away a thing when it is worn out, or partly so, or because we are tired of it, or want a change, has cast into out-of-the-way places, in house and barn and back yard, thousands of tons of old iron. The most of this is suitable for remelting, and today is worth as much per pound as junk as it was ten years ago when new. Here's a chance for the boys to do something; let them search out this discarded material and the result in the aggregate will be thousands of tons. Families who haven't any boys can easily pass the word to the boy next door.

H. H. WINDSOR

July 25th.



An Incline for Raising One End of an Automobile Which can be Operated by One Man by the Aid of a Winch and Cable: When the Upraised Wheels Reach the Top They are Automatically Locked in Position

ONE-MAN AUTO LIFTER FOR GARAGES

A lifting outfit with which one man can raise up the end of an automobile so that he can work underneath it conveniently, consists of a pair of wooden horses equipped with a winch and a cable. Each horse stands at an incline, having legs at one end only. After the cable has been attached to the running gear, one end of the automobile is drawn up the grooved backs of the horses by operating the winch. The car locks at the top automatically, and the cable can be moved out of the way.

¶Red, white, and blue globes have been substituted for ordinary transparent ones in many electric signs displayed by advertisers at Los Angeles.

AMERICA CALLS HER YOUTH

How the Great Conscription Lottery was Conducted at the Nation's Capital in Marked Contrast to the Draft of 1863, When Men were Drawn for Service in the Union Armies

By SEARLE HENDEE

TEN thousand five hundred black gelatin capsules, each containing a slip of paper bearing a printed serial number, were held in a large glass bowl and stirred constantly by a blindfolded man, while a second person, whose eyes also were covered, withdrew the tiny cylinders one at a time and handed them in turn to two announcers standing adjacent to him. This, briefly, describes the work of four of the nine principals who took active parts in the draft lottery conducted in the public hearing room of the senate office building at Washington several weeks ago.

Each of the numbers contained in the several thousand capsules represented a group of young Americans who had registered their names at their respective voting places in compliance with the national conscription law. The official drawing, which was carried out in the presence of members of the senate and house military committees, affected approximately 10,000,000 men, of whom 687,000 have since been ordered out by the first call for service.

This Old Draft Box Is a Treasured Relic of 1863. It was Used in Massachusetts and is Preserved Today for Its Historical Value. Scores of Similar Contrivances were Employed in Different Parts of the North

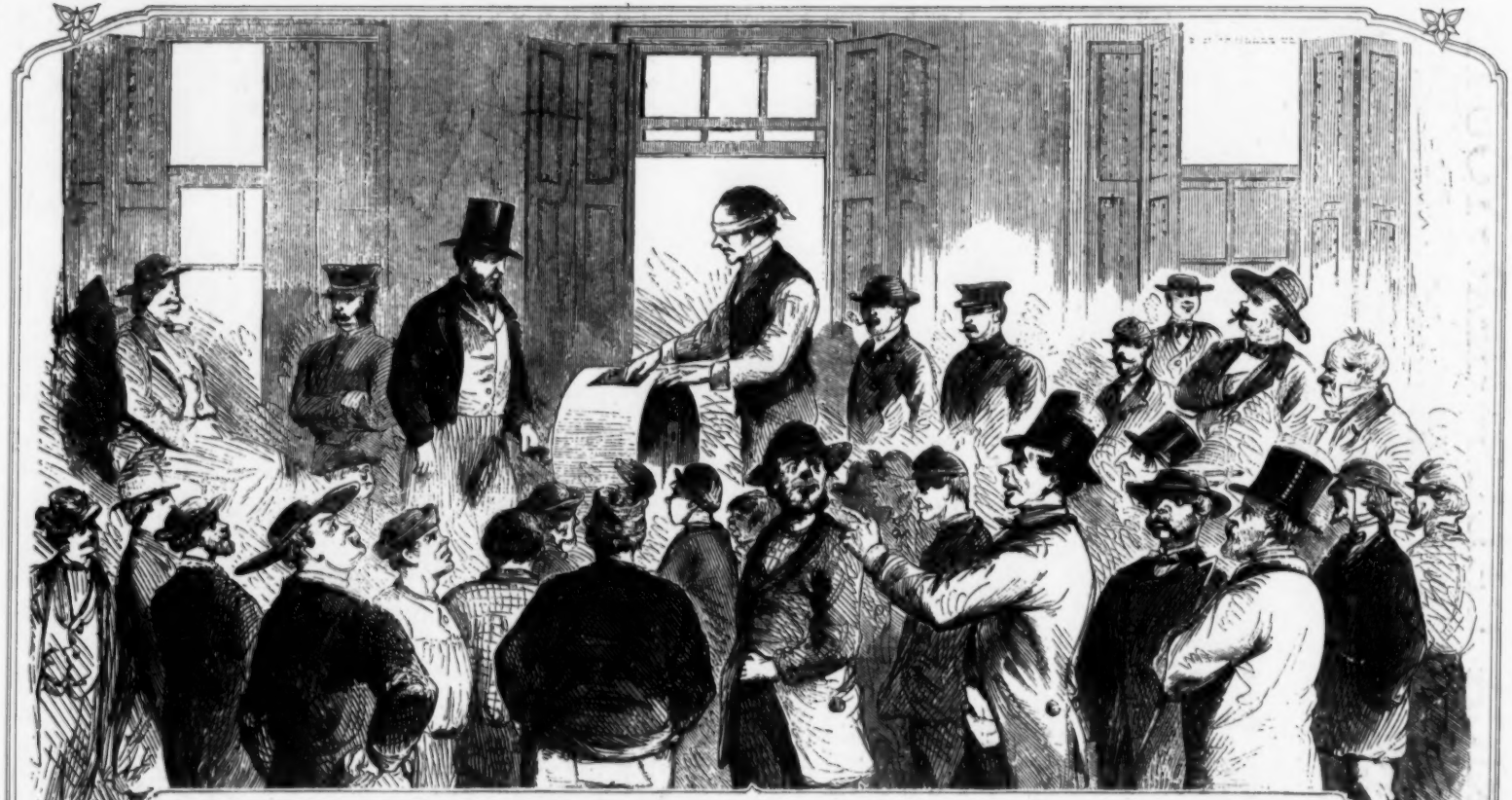
As one of the announcers received a capsule, he opened it and read aloud the number it contained so that it might be recorded simultaneously by three tally clerks. He then passed the slip to another attendant who checked the accuracy of the original reading. As the verification was made, the ninth participant inscribed the number in its proper order on a large blackboard. When the latter became filled, it was removed from the room and photographed, another board being substituted and the drawing continuing without interruption.

It was in this manner that the elementary selection of our new army was made. The work was commenced at 9:30 a. m., July 20, and was completed at 2:18 o'clock the following morning. The first number was removed from the glass bowl by Secretary of War Baker.

Striking differences contrast the present draft with that conducted in 1863 to provide much-needed fighters for the Union forces. Although approximately 3,000,000 men between the ages of 18 and 45 were enrolled, less than 100,000 of them were obtained, through conscription, to assist in ending the Rebellion. The scheme met with serious opposition from the time it was first proposed, and finally ended in the now historical draft riots which in New York were attended with outrages far more depraved and momentous than those recently perpetrated for other reasons at East St. Louis.

One outstanding phase of the former draft, which distinguishes it markedly from the current selection of soldiers, was an arrangement that permitted conscripts to purchase exemption by payment of a $300 fee. This obviously put the brunt of the burden on the shoulders of those least able to bear it, and enabled men in comfortable circumstances to escape their obligations.

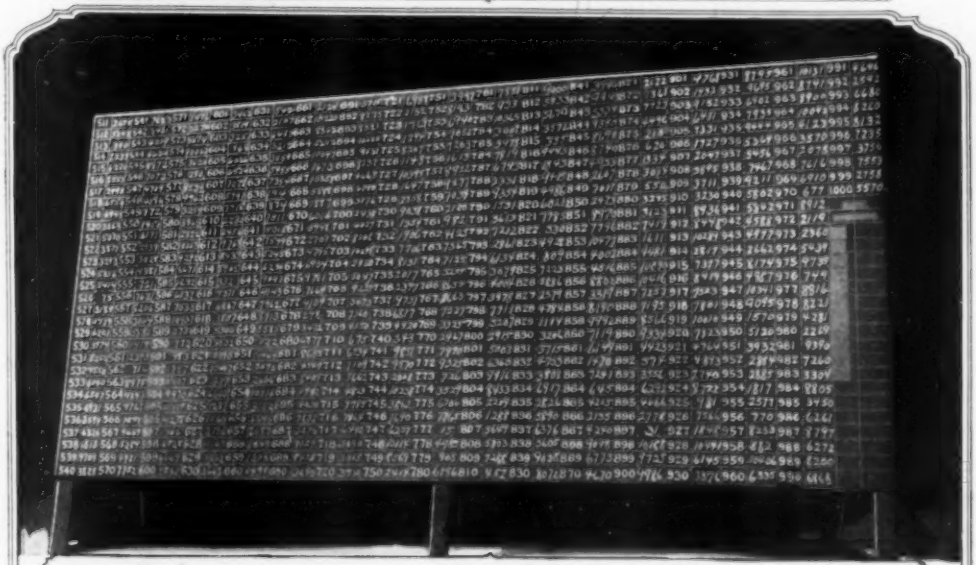
The actual drawing, instead of being executed at the national capital,



The Historical Sketch Presented Above Appeared in Harper's Weekly of September Fifth, 1863, and Pictures the Scene Inside of the Provost Marshal's Office in the Sixth District at New York City When the Draft was Resumed Five Weeks After the First Attempt had been Blocked by Serious Riots. It Shows the Marked Difference between the Methods Used at That Time and the Orderly, Careful Procedure Recently Observed at Washington, Where the Drawing for the Entire Nation was Conducted

REPRODUCED BY PERMISSION OF HARPER BROS., NEW YORK

Drawing the Fatal Black Capsules from the Glass Bowl in the Public Hearing Room of the Senate Office Building at Washington before Members of the Congressional Committees on Military Affairs: On This Solemn Occasion, the Futures of Thousands of Youthful Americans, and Doubtlessly the Fortunes of Nations, were Decided. Every Possible Precaution was Taken to Preclude Errors and Insure Absolute Fairness in the Lottery



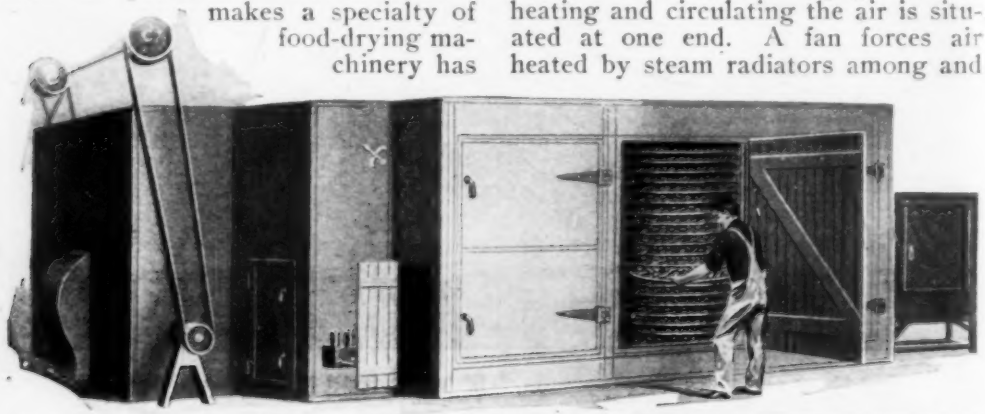
This Shows One of the Big Blackboards on Which the Serial Numbers were Chalked in Order as They were Drawn, Announced, and Verified. A Similar Count was Also Kept on Paper by Three Tally Clerks. As Rapidly as a Board was Filled, It was Removed from the Chamber and Photographic Record Made of It, Another Board being Substituted in the Meantime, so That the Drawing might Proceed without Interruption

was made a local affair, a school district, a township, or a county, according to the population, making its own selections. In sparsely settled districts where only a few men were liable for service, cards bearing the names were placed in a hat, or some similar receptacle, and drawn by a man, woman, or child appointed for the duty. Ordinarily the person who did the work was blindfolded. The drawings were conducted in halls, or other public places of assembly, before inhabitants of the vicinity who gathered to witness the event. In large centers the slips were usually placed in a "draft box" especially constructed for the purpose. These devices were of different types, but usually consisted of cylindrical or octagonal containers, built either of metal or wood, mounted in frames and provided with cranks so that they could be revolved readily.

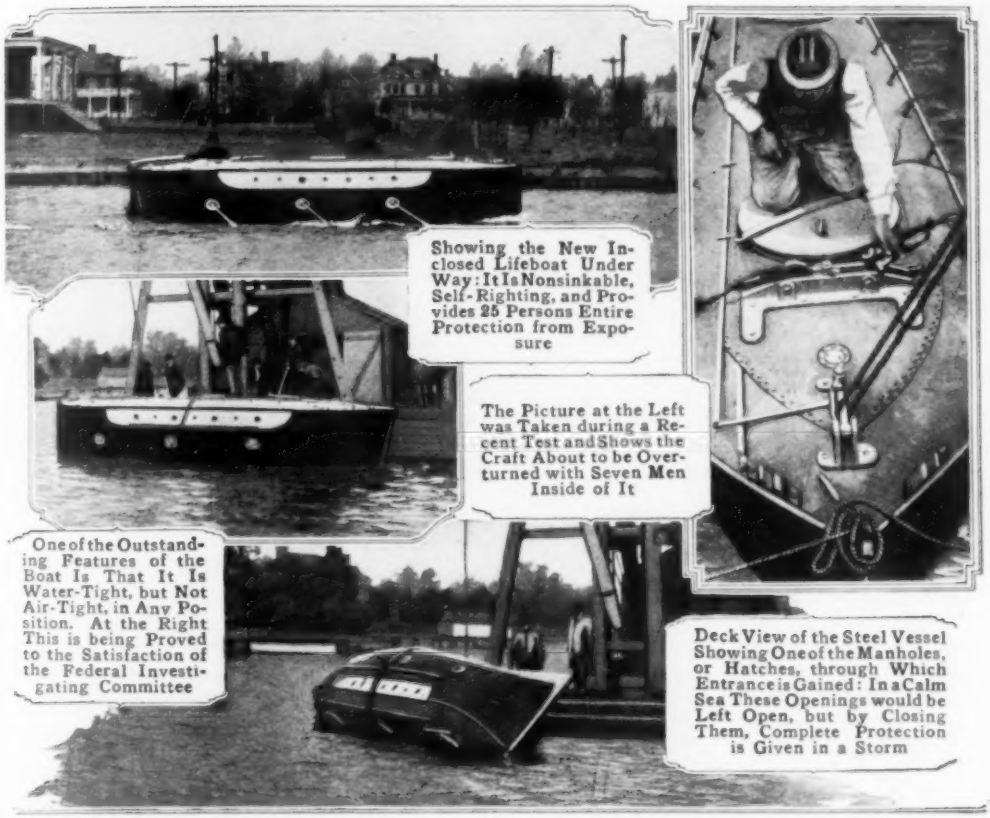
As the fateful cards were removed, the names they bore were called out and then recorded. Thus the conscripted men in many instances knew of their selection immediately. They could then obtain substitutes by paying men to take their places, or they could buy their immunity outright. Often they walked about the halls in which the drafting was in progress, holding money aloft and bargaining. As a result many crafty individuals took advantage of the chance for graft. One veteran of the war tells of a comrade who obtained money in that way. The man, dressed in civilian clothes, visited different drafting places at St. Louis, signed as a substitute under a fictitious name, received his money, and then disappeared, later putting on his uniform and returning to duty. Innumerable cases of similar fraud were undoubtedly carried out.

VEGETABLE DRIER TO SAVE GARDEN SURPLUS

Government officials and others who have been studying the country's food situation are firmly convinced that if the present season's big surplus in vegetables is to be saved, quantities of these products must be dried. In accord with the government's desire that means be provided for saving as much food as possible, a concern which makes a specialty of food-drying machinery has planned a drier suitable for large-scale community effort or for private industry, which can be built in part by those operating it and in part purchased from this firm. This vegetable drier measures about 25 feet long and contains six compartments, 3½ ft. square. The latter can be built by any carpenter with the aid of blueprints furnished by the company. Each chamber contains a number of trays, with galvanized-screen bottoms. The equipment for heating and circulating the air is situated at one end. A fan forces air heated by steam radiators among and



Vegetable Drier so Designed That It can be Constructed in Part by Those Who will Operate It: It Has a Capacity of One and One-Half to Two Tons of Vegetables Every 24 Hours and Is Suitable for Large-Scale Community Effort or for Private Concerns



Showing the New Inclosed Lifeboat Under Way: It Is Nonsinkable, Self-Righting, and Provides 25 Persons Entire Protection from Exposure

The Picture at the Left was Taken during a Recent Test and Shows the Craft About to be Overturned with Seven Men Inside of It

One of the Outstanding Features of the Boat Is That It Is Water-Tight, but Not Air-Tight, in Any Position. At the Right This is being Proved to the Satisfaction of the Federal Investigating Committee

Deck View of the Steel Vessel Showing One of the Manholes, or Hatches, through Which Entrance is Gained: In a Calm Sea These Openings would be Left Open, but by Closing Them, Complete Protection is Given in a Storm

through the trays, which can be removed as their contents are dried.

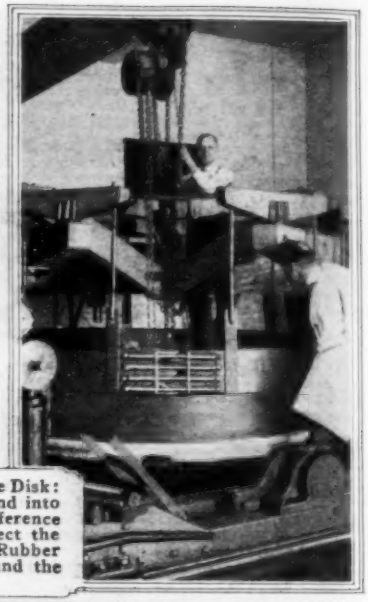
To secure the best results, vegetables to be dried should be partly cooked. This is done in a box steam cooker, situated at one end of this outfit and provided with a rack that will hold 10 trays. After remaining in the steam a few minutes the laden trays are transferred to the drying compartments. To operate this drier on the most profitable basis, which means drying one and one-half or two tons of vegetables every 24 hours, a cutter and a peeler, such as are used in canning factories, are required.

NEW LIFEBOAT NONSINKABLE AND SELF-RIGHTING

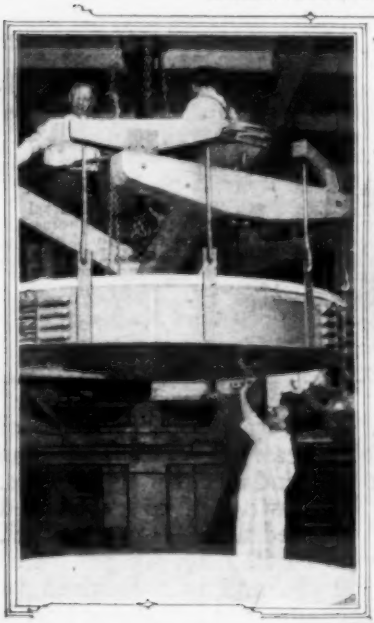
Recommendation of its formal approval was made a short time ago when a new unsinkable boat was thoroughly tested before the steamboat-inspection service's committee on life-saving appliances. The craft appears to be of remarkable seaworthiness and has many striking and meritorious features. Its hull is constructed of galvanized steel and is fitted with a 1,000-lb. keel. The boat is 26 ft. long, weighs, complete, 2,600 lb., and is authorized to carry 25 persons. It is equipped with an automatic releasing device, is entirely inclosed, self-righting, and waterproof—and admits air—even when overturned, and is readily handled. It is provided with a mast for sailing and signaling and is rowed with six oars projected through ports in the sides of the hull. In testing the boat before the committee, seven men entered it and closed the manhole plates. When the boat was overturned, it immediately righted itself and was subsequently found to be entirely free from water. The men within the craft suffered no injuries during this rough test and were able to release themselves immediately.

MASSIVE REFLECTOR FOR PREMIER TELESCOPE

Packing the Wonderful Mirror for Its Hazardous Trip: Its Surface was Protected by Thick Layers of Cotton, on Top of Which Heavy Paper was Placed Before a Wooden Covering was Fitted. The Mirror Is 101 Inches in Diameter and was Cast at St. Gobain, France, in 1906

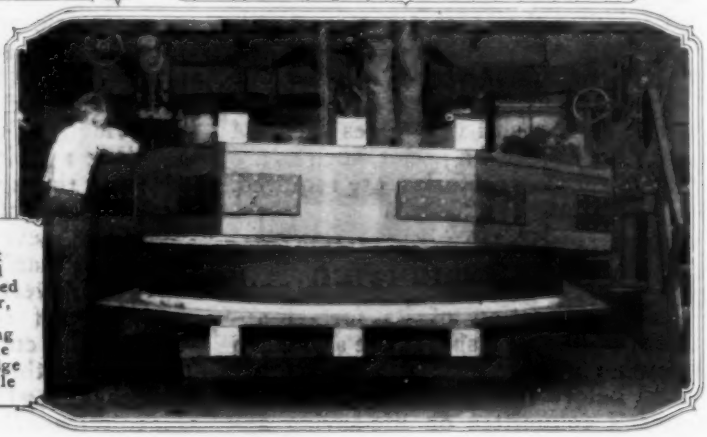


Making Ready to Hoist the Disk: Lowering a Friction Band into Place about the Circumference of the Mirror. To Protect the Glass, a Layer of Soft Rubber was Placed between It and the Steel Ring



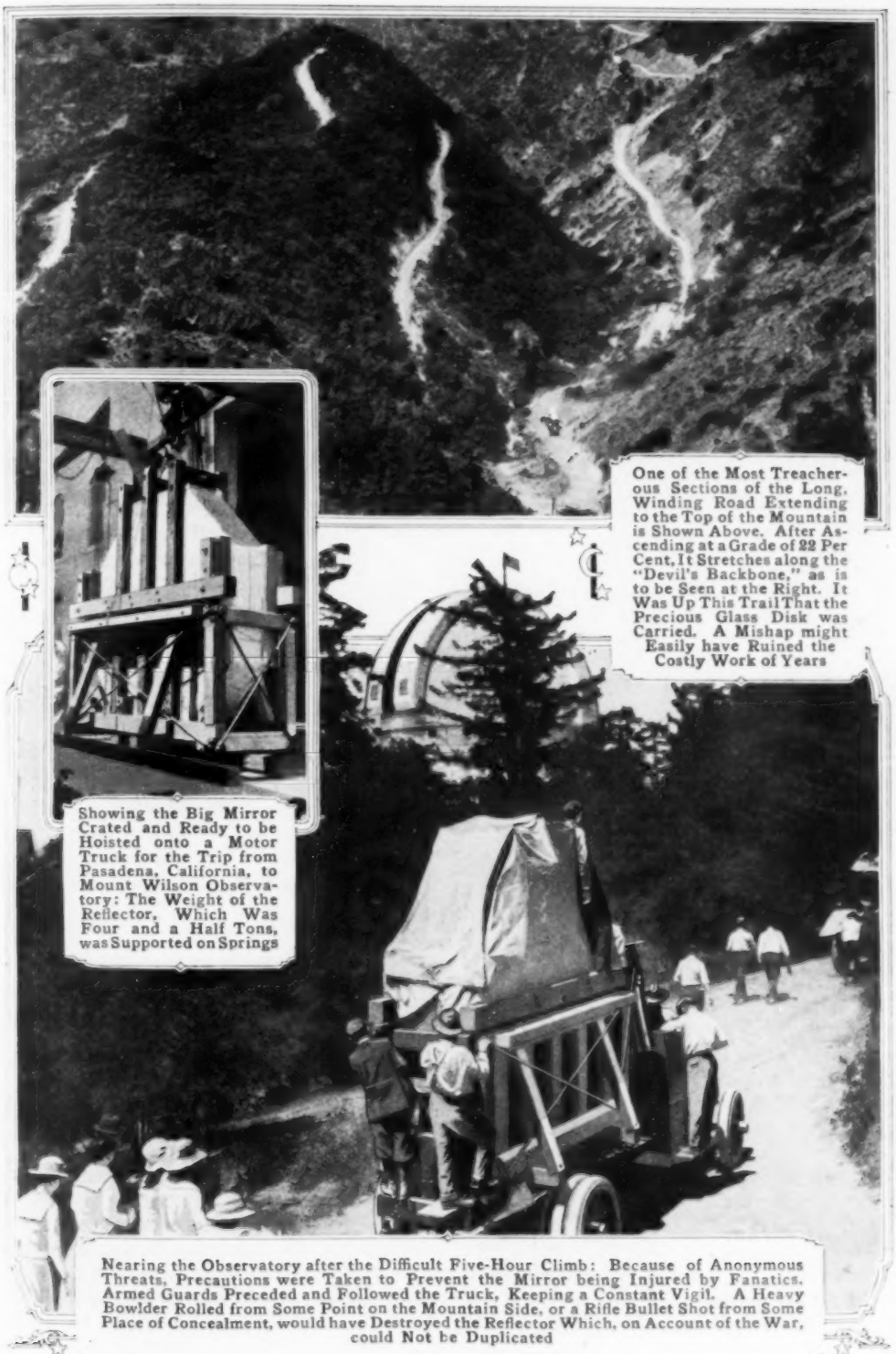
The Layers of Cotton Turned Back to Show a Small Section of the Silvered Surface of the Mirror: It Is the Largest Reflector of Its Kind in the World and will Enable Astronomical Investigations That Are Not Possible with Smaller Instruments

Gripped by a Friction Band Attached to a Crane, the Heavy Glass Disk was Slowly Lowered onto a Special Cotton Mattress Covering the Lid of the Box in Which the Mirror was Packed for Its Long Mountain Trip



The Picture at the Side Follows in Sequence That Above It, at the Left, and Shows the Box being Slipped in Place over the Reflector, Which is Resting on the Latter's Cover. After being Boxed in This Manner, the Mirror was Placed on Edge in a Spring-Cushioned Cradle

IS TRANSPORTED TO SUMMIT OF MOUNT WILSON



One of the Most Treacherous Sections of the Long, Winding Road Extending to the Top of the Mountain is Shown Above. After Ascending at a Grade of 22 Per Cent, It Stretches along the "Devil's Backbone," as is to be Seen at the Right. It Was Up This Trail That the Precious Glass Disk was Carried. A Mishap might Easily have Ruined the Costly Work of Years

Showing the Big Mirror Crated and Ready to be Hoisted onto a Motor Truck for the Trip from Pasadena, California, to Mount Wilson Observatory: The Weight of the Reflector, Which Was Four and a Half Tons, was Supported on Springs

Nearing the Observatory after the Difficult Five-Hour Climb: Because of Anonymous Threats, Precautions were Taken to Prevent the Mirror being Injured by Fanatics. Armed Guards Preceded and Followed the Truck, Keeping a Constant Vigil. A Heavy Bowlder Rolled from Some Point on the Mountain Side, or a Rifle Bullet Shot from Some Place of Concealment, would have Destroyed the Reflector Which, on Account of the War, could Not be Duplicated

CONTROL SUBMARINE CAMERA ELECTRICALLY

The New Deep-Sea Camera Aboard the U. S. S. "Vestal" during Recent Tests: At the Right is Shown an Enlargement of an Underwater Photograph, Made with the Instrument, Showing the Bottom of the Sea

Highly gratifying results have been attained with an electrically operated moving-picture camera that has been developed for deep-sea photography. Experiments have indicated that the apparatus is suited for practically all kinds of underwater work, and is therefore not merely valuable as an instrument for scientific investigations. It is composed of a series of water-tight cylinders held one above another in a steel framework, at the bottom of which is a shock absorber. The lower cylinder contains a gyroscopic stabilizer that overcomes the effect of vibrations and holds the instrument steady. Immediately above this member is the light projector, and above it the camera. The cylinder at the top contains a motor that drives a propeller which turns the outfit on its vertical axis. The equipment weighs about 1,500 lb., is built to withstand a pressure of 500 lb. or more to the square inch, and is regulated electrically from the deck of a vessel. By operating switches, the instrument is focused, tilted up or down, turned in different directions, its shutter actuated, and the film exposed.

NEW SUGAR-CANE HARVESTER DOES WORK OF MANY MEN

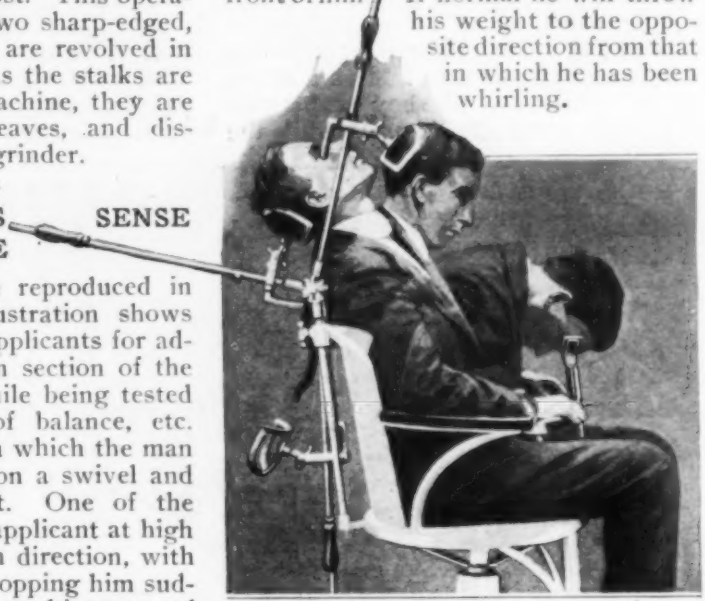
Tests conducted in Cuba are understood to have demonstrated the merits of a large sugar-cane harvester that has been built to accomplish the work of 60 or 70 men. The machine has an over-all length of about 30 ft., is 13 ft. high, 8 ft. wide, and weighs 11 tons. It is mounted on creepers so that it is

The Heavy Cane Harvester is Carried on Creepers so That Soft Ground Has No Terrors. It Delivers the Stalks Ready for Grinding

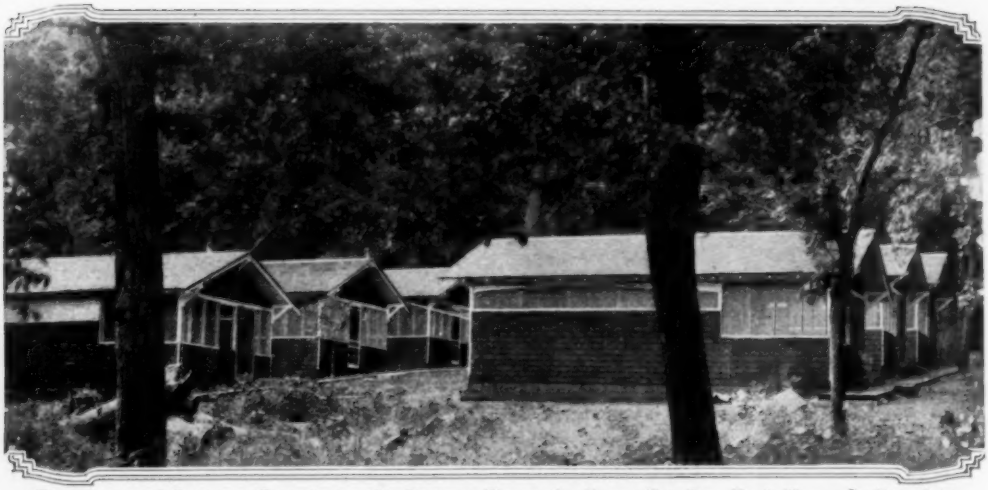
able to negotiate soft ground successfully, and is propelled by a gasoline motor that also drives the harvesting mechanism. One of its noticeable advantages is that it severs the cane stalks just above their roots, so that the valuable stumps, usually wasted by hand cutting, are not lost. This operation is performed by two sharp-edged, overlapping disks that are revolved in opposite directions. As the stalks are carried through the machine, they are topped, stripped of leaves, and discharged ready for the grinder.

TESTING AIRMAN'S SENSE OF BALANCE

The triple exposure reproduced in the accompanying illustration shows three postures which applicants for admission to the aviation section of the army must assume while being tested for dizziness, sense of balance, etc. The adjustable chair in which the man is seated, is mounted on a swivel and can be whirled about. One of the tests is to revolve the applicant at high speed, 10 times in each direction, with the eyes closed. On stopping him suddenly, he is asked to open his eyes and look in a certain direction. The first movements of the optics at such a time reveal to the examiner something of the man's ability to find his balance. On being stopped suddenly after a similar whirling, with the head bent forward and resting on a support, the would-be air man is told to sit up straight or raise his hands straight in front of him. If normal he will throw his weight to the opposite direction from that in which he has been whirling.



Composite Photograph Showing Would-Be Airman in Three Postures Assumed While Taking Tests for Dizziness and Sense of Balance: The Chair is Made so That It can be Whirled About Rapidly



This Group of Cottages Constitutes the Summer Home of a Large Family. Each House Is Complete in Appointments and Equipment

GROUP OF TINY BUNGALOWS IS FAMILY'S SUMMER HOME

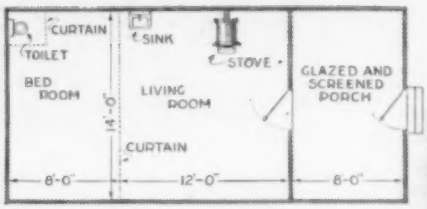
SIX separate cottages and a garage in the midst of beautiful woods constitute an unusual summer home that has been built for a family of ten persons. The colony idea is no more novel, however, than the manner in which daily life in the camp is conducted. The ages of the eight juvenile members of the family range from 16 to 3½ years. Each of the two oldest daughters has the care of two of the children and one of the bungalows. The boy has his own house and looks after himself, while the parents live together in their own quarters with the youngest child.

In this way all of the housework is equally proportioned so that the burden of it falls upon no one pair of shoulders, and servants are not required. Each of the cottages is thoroughly equipped with modern facilities, including telephones, electric lights, and toilets, so that it is independent of the others. The members of each little household prepare their own breakfasts and suppers. Dinner is served at noontime,

The Family Which Inhabits the "Colony Home" in Summer Time: The Lucky Boy Keeps Bachelor's Quarters

In Front of Cottage No. 2 Is a Sand Pile Which Is Popular with the Younger Children. As the Cottages are Built in a Grove, the Plot is Nearly Always Shaded

Solid Comfort for Dad in His "Cottage Den," Which Is One of the Six Cottages

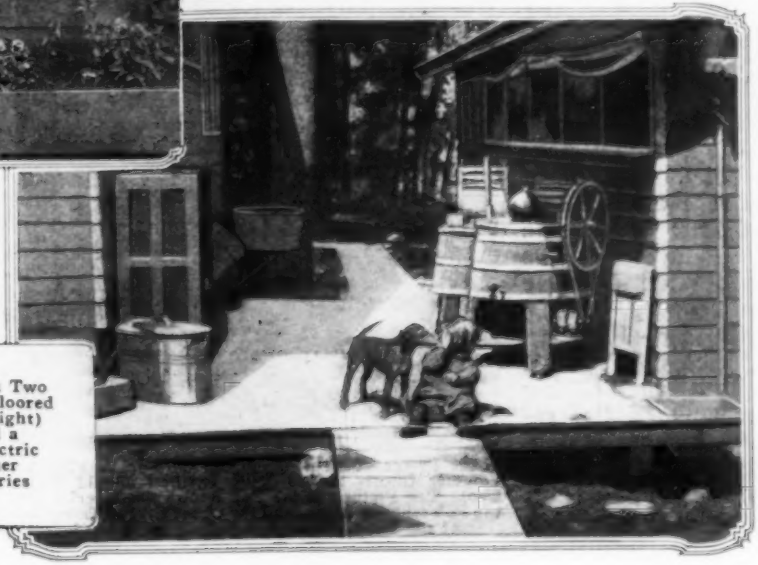


A Rough Floor Plan Showing How All the Cottages are Laid Out: They Are Both Convenient and Inexpensive

A Corner in One of the Bedrooms is Seen at the Left. The Toilet Seat is Screened by a Curtain

The Finest of Modern Plumbing is Used in Each Cottage. The Lavatory Serves as a Sink Also

Flower Beds Surround All the Houses. Pansies are Grown Because They Do Well in Deep Shade

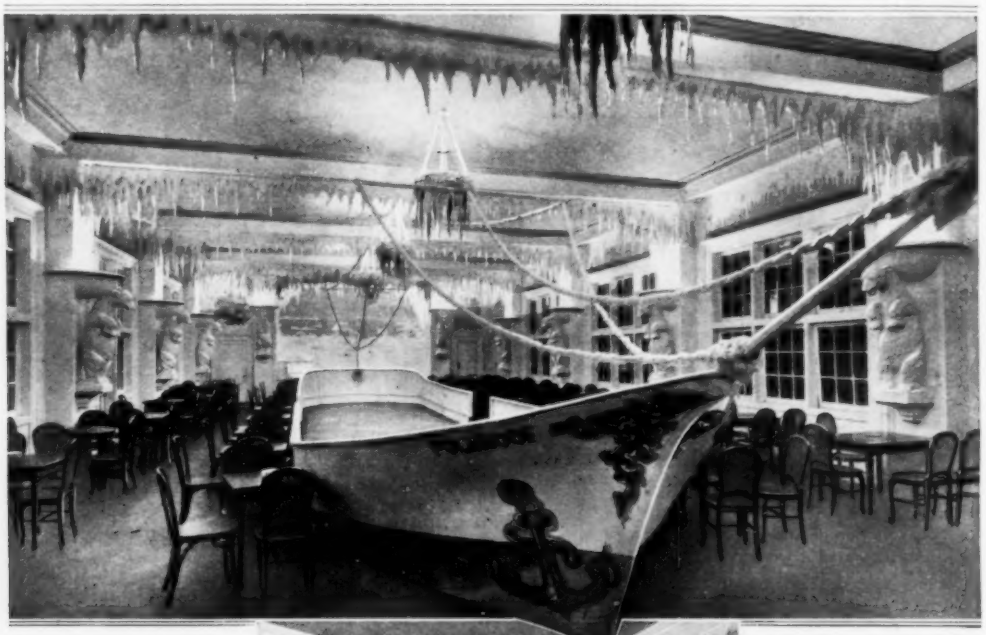


At the Rear, between Two of the Houses, Is a Floored Area (Seen at the Right) Where are Placed a Refrigerator, an Electric Washer, and Other Necessary Accessories

and at this meal the whole family assembles in one of the houses especially equipped as a kitchen and dining room.

Each of the cottages is 14 by 28 ft. in size, with the front section arranged as a screened porch. The exterior walls are covered with stained shingles, and the roofs have broad overhanging eaves. Pains have been taken to make them all as comfortable and attractive as possible. Including plumbing and wiring, the cost of each of the houses was about three hundred and fifty dollars.

FROZEN-NORTH PAVILION HOTEL'S SUMMER FEATURE

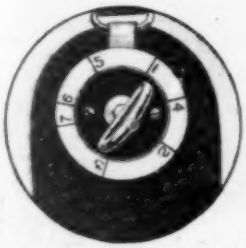


If the Power of Suggestion Amounts to Anything, Summer Guests of the Roof Pavilion should Feel Cool. The Picture at the Top Shows the Interior of the Refreshment Salon, and the Other Gives a Glimpse of the Room through Which It is Entered

Arctic decorations lend a cool, refreshing appearance to a summer pavilion established on the roof of a midwestern hotel. Scenes of the Far North form a frieze around the walls of one of the rooms, while frosty-looking "icicles" depend from the ceiling beams of the refreshment salon. In the middle of the floor is a boat, the deck of which serves as a dance platform and also as a stage for entertainers. The figures of white bears, spaced at intervals about the walls, support the outer rims of semicircular bowls used for indirect lighting. This arrangement adds considerably to the general effect of the decorating scheme. The tables are placed in rows around the boat, which is rigged with ropes.

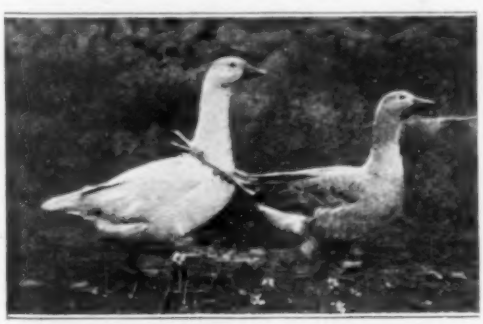
USE OF DIAL ADDS EXTRA EXPOSURE TO FILM

By equipping a camera with a new attachment, seven exposures can be made on a standard six-exposure film. The device consists merely of a dial which fits around the winding key. The additional exposure is obtained by eliminating all blank spaces between the exposures. The camera is loaded in the usual manner, but the numbers which can be seen through the red peephole are disregarded except that at the outset the winding key is turned until "1" appears. Then the dial is moved around until its division marked "1" is directly beneath one end of the key which has been identified by a scratch or notch. Each succeeding exposure is made by giving the key one full turn and then moving it around to the dial number corresponding to the number of the exposure.



YOKE KEEPS "FLYING" GOOSE IN POULTRY YARD

Yoked geese are novelties—at least to those of us who live in cities. A certain farmer has a white goose that is adept in getting over poultry-yard fences. To prevent this practice, a yoke was placed about its neck.



As a Rule a Goose is Easily Kept within an Inclosure, but This One must be Yoked

CLIMBING OF CACTUS TREE NOT PAINLESS DIVERSION

Most persons are more or less familiar with the giant cactuses of Arizona, but it isn't every one who has seen a man climb to the topmost branches of one. Reproduced herewith is a photograph of one of these big trees of the desert, and reposing in it a westerner. Because of its age, this particular cactus is bald in spots. The man did not negotiate it, however, without experiencing some discomfort.

FLY KILLING MADE SPORT BY NEW INDOOR GUN

Through the invention of an odd mechanical gun, fly shooting has been made a possible sport for young America. The weapon hurls a disk-headed arrow with sufficient force to kill a fly at several paces. It will not injure furniture or break window panes, however, and is therefore fairly safe in the hands of the youngster who aspires to be a parlor marksman. Incidentally it offers an easy way of eliminating the flies that often find comparative safety on the ceiling of a room. The disk is perforated to reduce head resistance, and is flexibly attached to the arrow so that it flattens out and delivers a blow even when it strikes at an angle.

The Disk-Headed Arrow Kills the Fly but does Not Strike with Enough Force to Break a Window or Mar Furniture

"SAMMY" REACHES LAFAYETTE'S MARTYRED LAND

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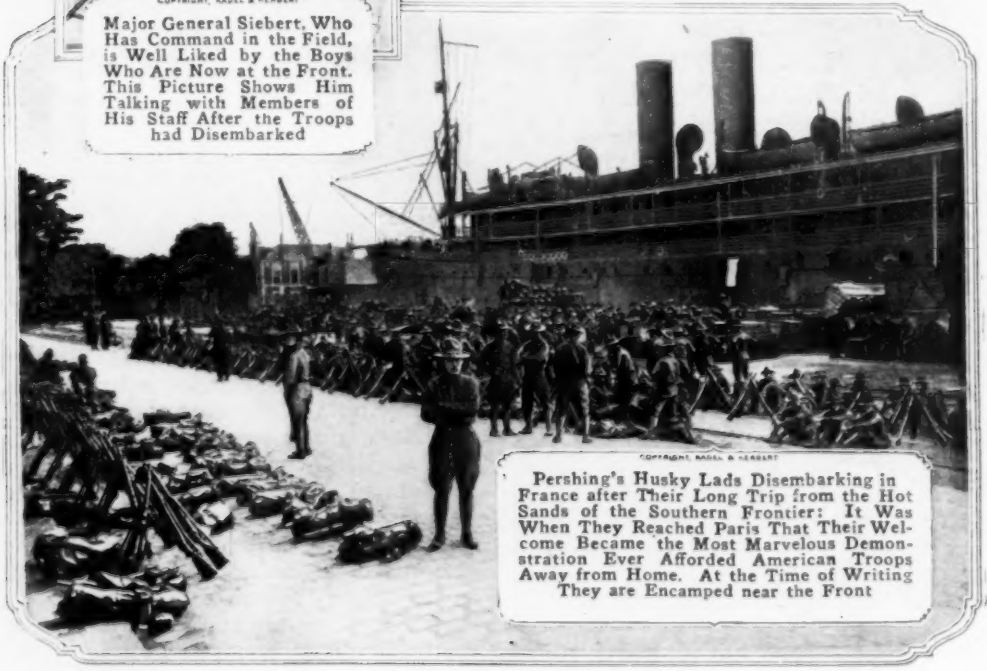
American Transports, Loaded with Sun-Baked Fighters from the Mexican Expedition, Arriving at a French Port Some Weeks Ago: The Appearance of the "Sammies" Surprised the Populace in France as Much as the News of Their Landing Astonished Millions of Persons in This Country, but It Required Only a Few Minutes to Deck the Streets with the Stars and Stripes and Give the Boys a Hearty Welcome

COPYRIGHT, NAGEL & HERBERT

Major General Siebert, Who Has Command in the Field, is Well Liked by the Boys Who Are Now at the Front. This Picture Shows Him Talking with Members of His Staff After the Troops had Disembarked



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Pershing's Husky Lads Disembarking in France after Their Long Trip from the Hot Sands of the Southern Frontier: It Was When They Reached Paris That Their Welcome Became the Most Marvelous Demonstration Ever Afforded American Troops Away from Home. At the Time of Writing They are Encamped near the Front

BOYS WHO FLAUNT OUR EMBLEM BEFORE BOCHES

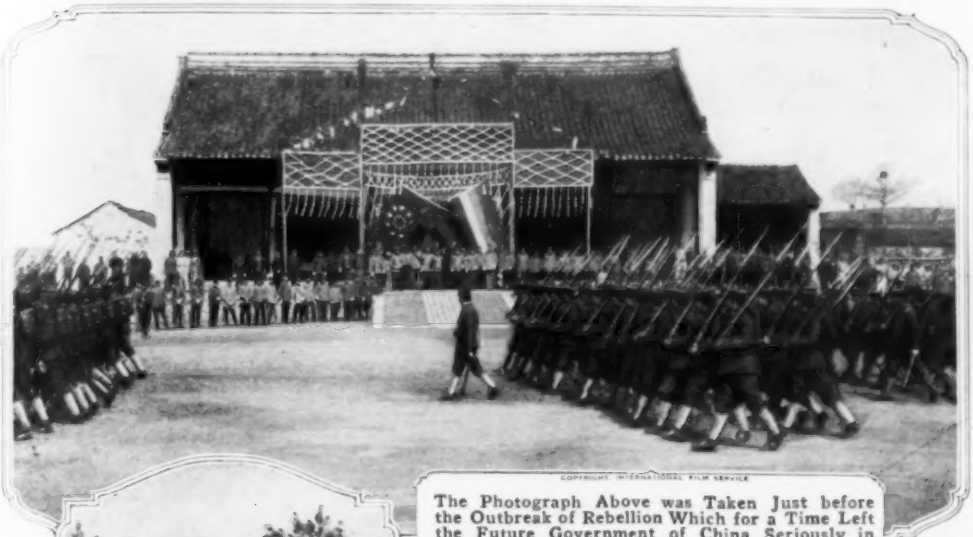
The Stars and Stripes Unfurled at the Front: A Sight That Sends a Thrill of Gladness through the Heart of Every True American. The Picture was Taken in the Wooded Camp of a Company of American Boys on the Aisne. It Shows a Mere Handful of Fighters, but a Group Composed of Nervy Fellows Who Soon will Have Thousands of Equally Nervy Comrades of Their Own Blood Working with Them

The Boys Included in This Photograph Are the Same as Those Shown in the Picture at the Top of the Page. They are Putting on Their Gas Masks Preparatory to Leaving for the Trenches. It Is upon Just Such Scrappers as These That the Attention of the Whole Civilized World is Focused. It Is Up to the American Boy to Turn the Tide of War, and Liberty and Justice Await His Work

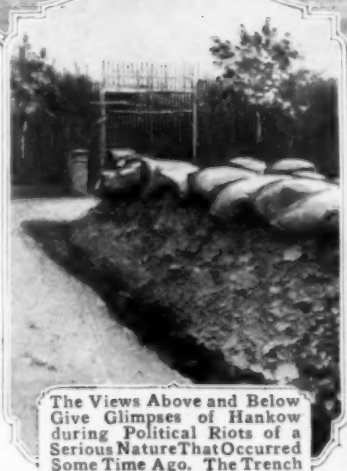
VAUDEVILLE BENEATH THE TRENCHES IN FRANCE

MILITARY authorities, during the great war in Europe, have not ignored the psychology of relaxation. Wherever and whenever it has been possible, diversion of some sort has been provided for the men at the front. The picture reproduced above shows the interior of a small subterranean theater established in the vicinity of Verdun. It is one of the places where soldiers who are off duty are given a chance to relax temporarily and forget the hardships and horrors endured on the firing line.

WAR STEPS, RIOTS, AND REBELLION STIR CHINA



The Photograph Above was Taken Just before the Outbreak of Rebellion Which for a Time Left the Future Government of China Seriously in Doubt. It Shows the Vice President, General Feng Kuo-Chang, Who Is Also the Tuchun of the Province of Kiangsu, Reviewing Troops on a Ceremonial Occasion at Nanking



The Views Above and Below Give Glimpses of Hankow during Political Riots of a Serious Nature That Occurred Some Time Ago. The Trench was Established, by German Reservists, in the Street Facing the Japanese Concession

Three Recruits Doing the "Goosestep," a Military Eccentricity Taught Them by Germans against Whose Government the Power of China may be Turned at Any Time: Not Only are All Chinese Soldiers Drilled in This Way of Marching, but Likewise All School Children of Japan

Carrying Away the Dead Following the Disturbance: Fire Destroyed Houses and Business Structures Covering an Area of Some 2,000 Square Yards and Caused the Death of Nearly 1,000 Persons. The Hankow Volunteer Corps, Composed of Foreigners of All Nationalities, was Called Out, and Bluejackets from a United States Gunboat were Landed to Protect the Consulate

FRANCE HAILS PERSHING THE MAN OF THE HOUR

NO American before him ever received such a rousing, whole-hearted welcome in a foreign land as did Maj. Gen. John J. Pershing upon his arrival in Paris. Thousands of men, many of them crippled veterans of the western front; thousands of women, most of them the mothers, wives, and widows of gallant poilus, and thousands of children, crowded the streets of the somber capital for hours, waiting to greet with ringing cheers and waving arms the chief of the "Sammies." Soldiers lined the thoroughfares and at times worked with might and main to keep the enthusiastic crowds out of the way of the approaching motor cars. General Pershing is seated with M. Painlevé, the French minister of war, in the automobile in the foreground.

ENGLAND SALUTES PERSHING ON WAY TO FRONT

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America's Favorite Picture of the Commander-in-Chief of Its Overseas Force, Major General John J. Pershing, Who is Expected Soon to be Elevated to Lieutenant General, and Probably Later to the Rank of General, an Office That has Not been Filled in Our Army Since the Death of General Sheridan: This Photograph Shows the Fighter Accompanied by General Pitcairn Campbell, Representing the British War Office

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There Is Little Wonder That Major General Pershing is Rapidly Winning a Place in the Hearts of Our Allies, for Above All Things, He Is a Soldier and a Man. From Left to Right Stand: Pershing, Ambassador Page, Vice Admiral Sims, U. S. N., Lord Derby, British Secretary of War, and Field Marshal Lord French. The Picture was Taken Immediately upon the General's Arrival in England

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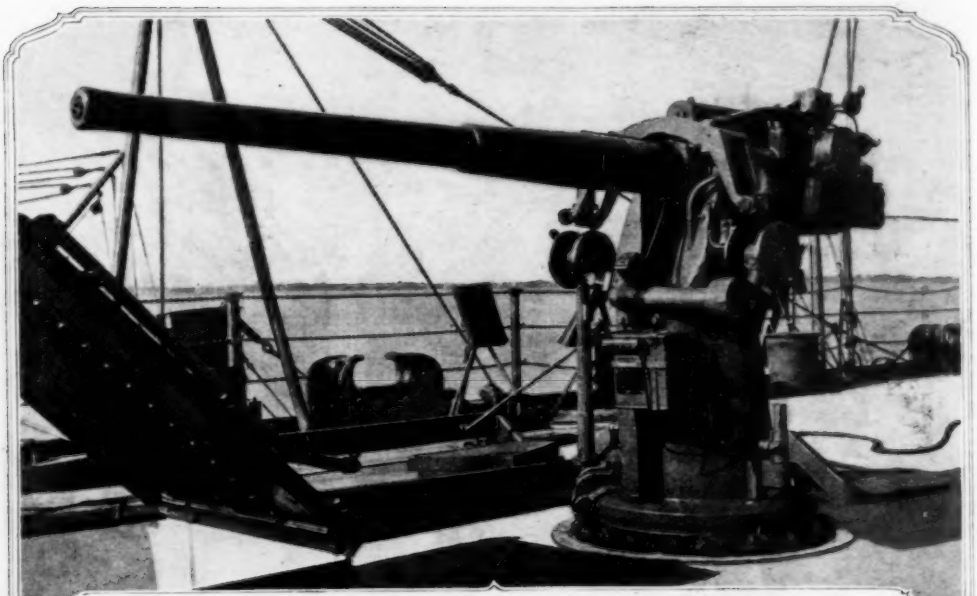
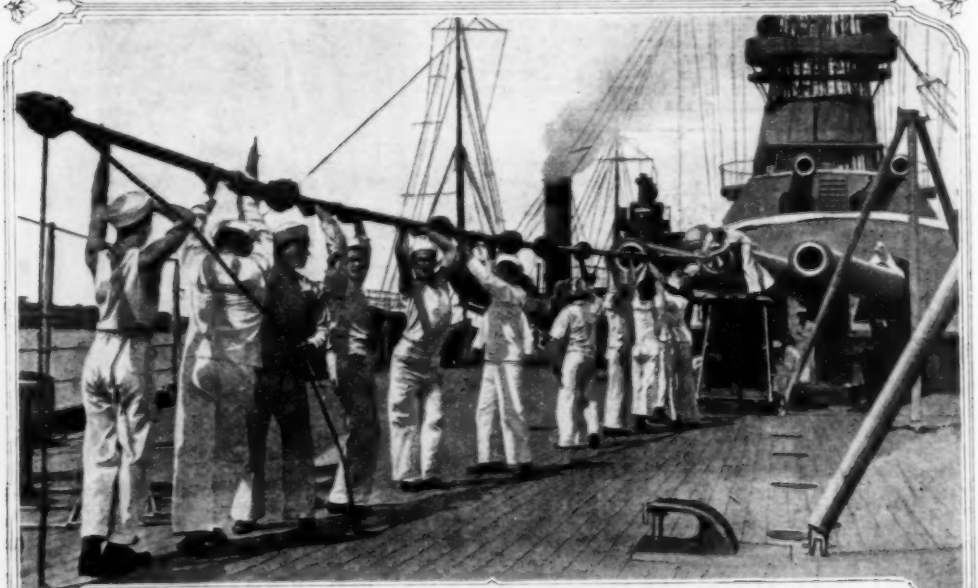
The Big Chief of the "Sammies" Following General Pitcairn Campbell down the Gangway of the Vessel That Carried the American Standard Bearer and His Staff across the Atlantic. The Three Pictures Furnish an Interesting Study of General Pershing's Ever-Changing Facial Expression

GLIMPSES OF OUR "JACKIES" AT WORK

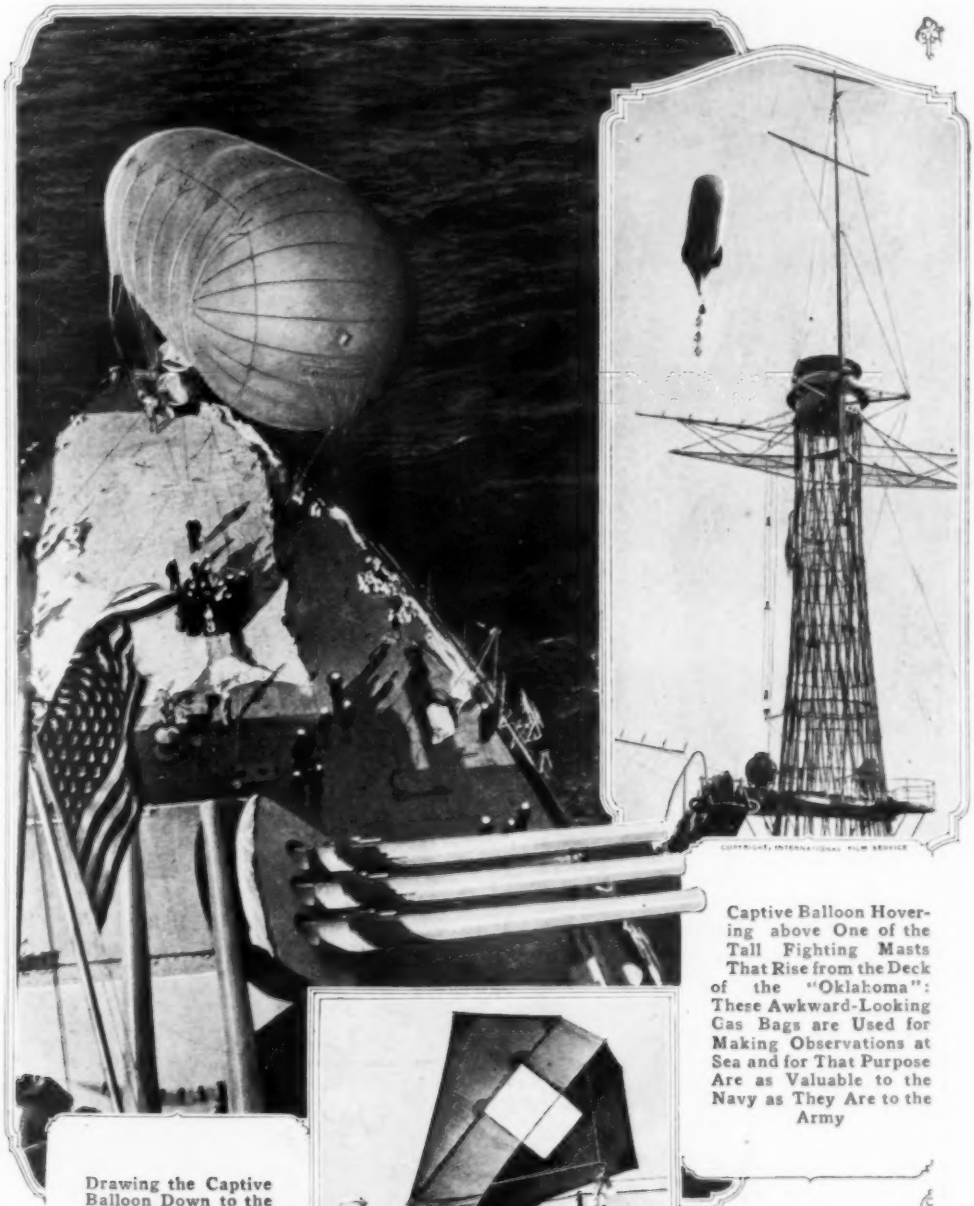


Giving a Close View of One of the Speedy Anti-Aircraft Guns Mounted on the Deck of the War-Gray "Oklahoma," Ready for Business: The Dreadnaught Is a Sister Ship of the "Nevada" and Is One of the Navy's Most Formidable Steel Fighters. Its Length Is 583 Feet and Its Normal Displacement 27,500 Tons. The Vessel's Main Belt of Armor Is 17½ Feet Wide and Extends More Than Eight Feet below the Water Line



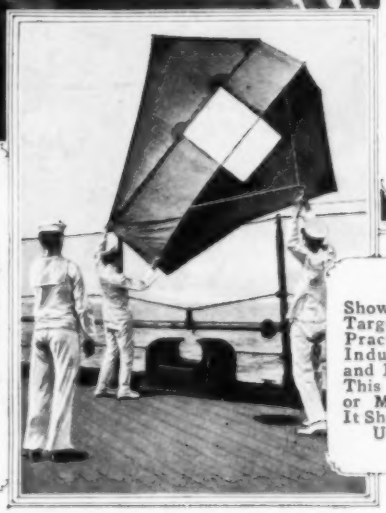
"Jackies" at Work Cleaning the Bores of the 14-Inch Guns Which may Yet Help the Kaiser See Light: Ten of These Big Rifles are Mounted in Four Triple and Double Turrets. The Ship's Other Armament Consists of 21 Five-Inch Guns and Four Submerged 21-Inch Torpedo Tubes. The "Oklahoma" Was the First of Our Fighters to be Constructed in Accordance with the "Everything or Nothing" Idea of Protection

ABOARD THE DREADNAUGHT "OKLAHOMA"



Captive Balloon Hovering above One of the Tall Fighting Masts That Rise from the Deck of the "Oklahoma": These Awkward-Looking Gas Bags are Used for Making Observations at Sea and for That Purpose Are as Valuable to the Navy as They Are to the Army

Drawing the Captive Balloon Down to the "Oklahoma's" Deck Following an Ascension: The Picture Gives One a Fair Conception of the Relative Size of These Big "Sausages," Which Often Play a Most Important Rôle in Naval Operations. All of the Photographs Presented on These Two Pages have been Passed by the Censor



At the Side, Seamen are Shown Putting Up One of the Big Target Kites for the Aero Gunners. Practice Shooting is Not Usually Indulged in during Time of War and It Is Therefore Probable That This Picture was Taken in the Past, or Merely Posed. In Any Event, It Shows the Character of the Targets Used to Represent Air Craft

SPIRITED CHARGE OF FRANCE'S STEEL CAVALRY

THE picture above, taken in the heat of battle, shows a squadron of French "tanks" attacking German positions on the western front. Although the dispatches have carried detailed accounts of the stirring assaults made by these formidable engines, no such graphic illustration of their actual use as this one has previously reached America. In the foreground one of the heavy creeping monsters is crossing a shell-battered trench, while ahead of it a half dozen more may be seen pushing through entanglements and forging ahead into the fray.

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A Striking Example of Close Coöperation of the Allies: These Sturdy, Sun-Baked Fijians (British Subjects) are Shown being Reviewed at Honolulu by the Commander of the Hawaiian Department. Many Americans Feel Far Removed from the War and Therefore Manifest a "Business as Usual" Attitude. Yet These Barelegged Fellows from the Pacific are Doing Their "Bit." They were Photographed While on Their Long Journey to France Where They are to Serve as Stevedores on Army Transports

PHOTO COPYRIGHT UNDERWOOD & UNDERWOOD

To Those Who Object to Service Overseas, but "would Gladly Fight if America were Invaded." This Picture from Gallant France is Respectfully Submitted. It Shows Rows of Naked Trees Lining What Was Once a Beautiful Street of Homes in a Prosperous French Village. This Is What War in One's Native Land Means. The Youth of America Is Fortunate, for He Goes into Battle Knowing That Roofs Shelter the Dear Ones He Leaves Behind

STRIKING ASPECTS OF WAR ON WESTERN FRONT

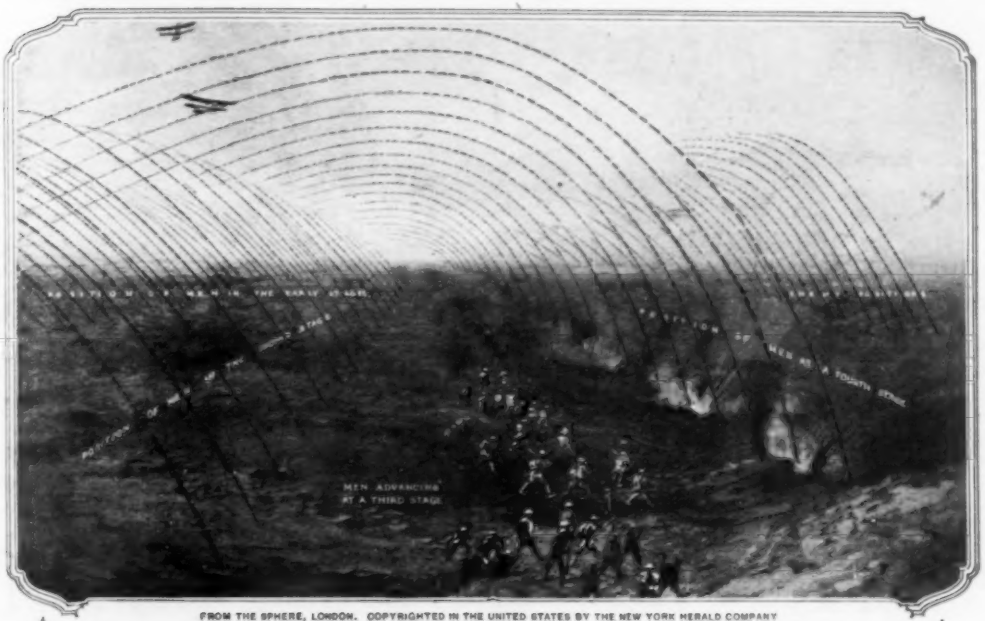
FROM THE SPHERE, LONDON. COPYRIGHTED IN THE UNITED STATES BY THE NEW YORK HERALD COMPANY

Removing the Crippled and Dying from the Field While an Attack upon the German Positions Is in Progress: The Picture Tells, as Words Cannot, the Story of the Stretcher Bearer, Who of Late Seems to have been Classed with the Shirkers by Many Self-Appointed Critics. When a Fellow is Hit and is Chewing the Dirt and Cursing for Water, the Grandest Emblem on Earth Is the Red Cross on the Sleeve of Some Plucky Boy Who Is Game Enough to Brave a Shrieking Inferno of Shrapnel to Reach Him. The Work of the Field-Ambulance Service, Whether Regimental or Red Cross, is Not Conducted by Cowards

Highlanders in Boston Assisting in Gaining Recruits for the Canadian Forces: The Scotch Veteran Who Is Next to the Mayor of the City Is a Captain and, It will be Observed, is Wearing Knickers in Place of Kilts

These Days There Is Nothing That Pleases a German Quite so Much as the Sight—and Taste—of Regular Food. The Picture Shows a Group of Captives being Questioned by British Officers and Allowed a Few Minutes in Which to Enjoy Refreshments before Submitting to Registration. To the Teutons Who have been Told They would be Horribly Tortured if Captured by the British, the Offer of Something to Eat Comes as a "Grand and Glorious Feeling"

WHERE "SAMMIES" WILL SOON HAVE MUCH TO DO



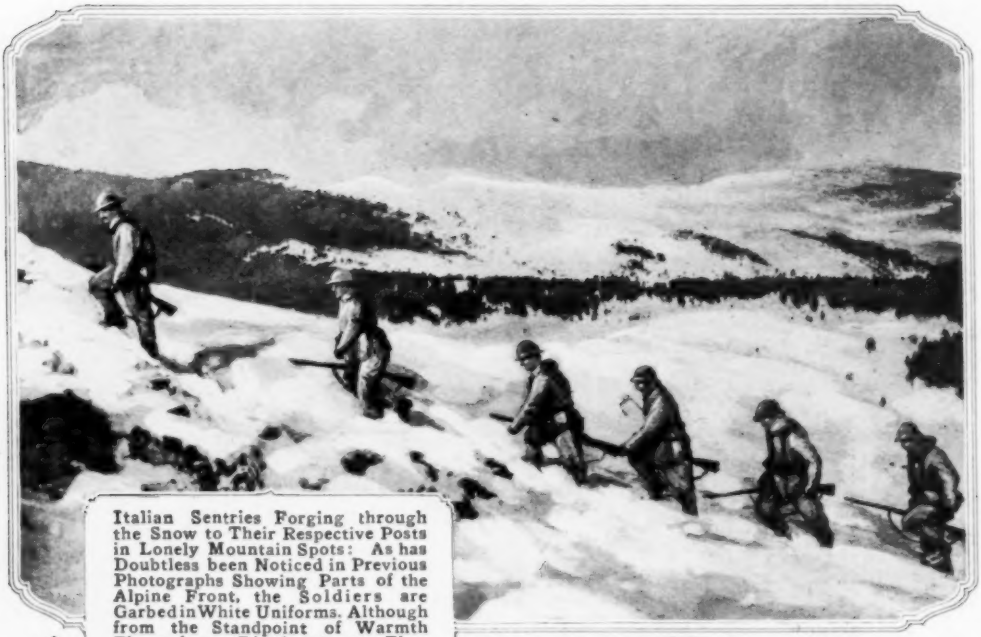
FROM THE SPHERE, LONDON. COPYRIGHTED IN THE UNITED STATES BY THE NEW YORK HERALD COMPANY

British "Tommies" Making an Advance upon German Trenches While Protected by the Artillery's Barrage Fire: The Drawing Shows with Great Clearness the Several Stages of the Advance, and Explains Graphically How the Constant Rain of Shells Precedes the Soldiers Step by Step. All of This is Timed to the Second. All the Gunners must Change Their Ranges Simultaneously and Precisely at the Right Instant, While the Men must Keep Moving Ahead at an Absolutely Accurate Pace. The Remarkableness of the Barrage Fire is Appreciated When It is Remembered That the Gunners Depend Entirely upon Mathematical Calculations

The Drawing, Partly in Phantom, Indicates in Detail How the British Mined a Section of the Messines Ridge in June, Annihilating Hundreds and Possibly Thousands of the Enemy by Detonating 1,000,000 Pounds of Explosives. The Sharp Turns in the Tunnels, and the Heavy Walls Built of Concrete and Sandbags, were Erected to Prevent the Blast from Spending Part of Its Force in the Wrong Direction

FROM THE SPHERE, LONDON. COPYRIGHTED IN THE UNITED STATES BY THE NEW YORK HERALD COMPANY

ON SNOW-COVERED ALPINE BATTLE GROUNDS



Italian Sentries Forging through the Snow to Their Respective Posts in Lonely Mountain Spots: As has Doubtless been Noticed in Previous Photographs Showing Parts of the Alpine Front, the Soldiers are Garbed in White Uniforms. Although from the Standpoint of Warmth These have Disadvantages, They Also Have the Big Merit of Being Inconspicuous

Italian Sentry on Duty in a Tunnel, Supposedly on the Trentino Front: The Operations in the Mountains Are Chiefly of an Engineering Character and Therefore Represent Some of the Most Wonderful Phases of the Present War. The Purpose of the Bore Shown Here is Not Known, but It has Probably been Driven to Facilitate the Transportation of Munitions, or to Make Available as a Gun Position Some Vantage Point That Commands an Enemy Defense

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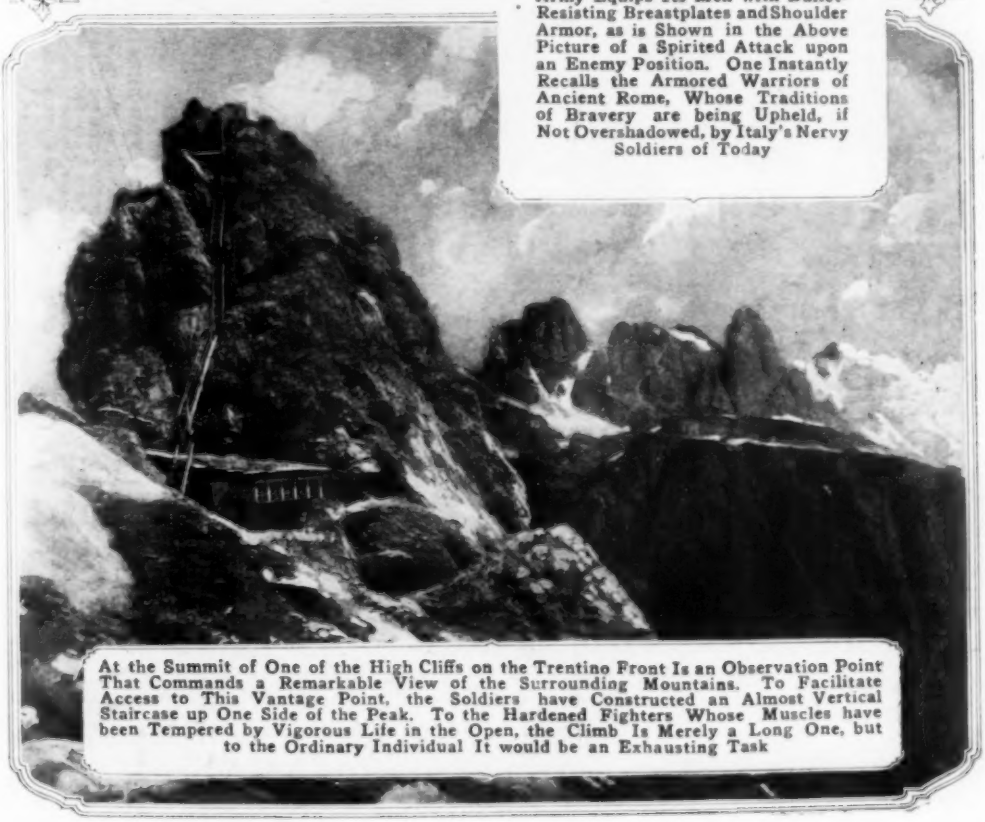
When Operating on the Snow, High in the Alps, the Glare of the Sun Is a Thing with Which to Reckon. The Italians Shown in the Picture Above are Equipped with Colored Goggles That Protect Their Eyes from the Dazzling Light. It will be Observed That the Men's Hands and Faces Are Extremely Dark. That Is Because They are Coated with Black Grease Which Prevents Sunburn

WHERE ITALY UPHOLDS ANCIENT TRADITION

DRAWN FROM MATERIAL SUPPLIED BY F. MATANIA FOR THE SPHERE, LONDON, AND COPYRIGHTED IN THE UNITED STATES BY THE NEW YORK HERALD COMPANY

When Particularly Hazardous Work is to be Done by a Group of Picked Fighters, the Italian Army Equips Its Men with Bullet-Resisting Breastplates and Shoulder Armor, as is Shown in the Above Picture of a Spirited Attack upon an Enemy Position. One Instantly Recalls the Armored Warriors of Ancient Rome, Whose Traditions of Bravery are being Upheld, if Not Overshadowed, by Italy's Nervy Soldiers of Today



At the Summit of One of the High Cliffs on the Trentino Front Is an Observation Point That Commands a Remarkable View of the Surrounding Mountains. To Facilitate Access to This Vantage Point, the Soldiers have Constructed an Almost Vertical Staircase up One Side of the Peak. To the Hardened Fighters Whose Muscles have been Tempered by Vigorous Life in the Open, the Climb Is Merely a Long One, but to the Ordinary Individual It would be an Exhausting Task

MAKING SHRAPNEL FOR PERSHING'S GUNNERS IN FRANCE

THIS picture shows the interior of one of our big munition plants, where shrapnel and other forms of ammunition is being manufactured in enormous quantities. The large bins to the right are filled with tens of thousands of balls that are ready to be placed in explosive projectiles. A three-inch shrapnel contains from 240 to 250 of these bullets tightly imbedded in rosin. Shiploads upon shiploads of such missiles are being produced in all possible haste for the use of our gunners now at the front and those who soon will follow. The photograph reproduced herewith has been passed by the military censor and contains no information that will be welcomed by the enemy.

CONCRETE FIELD FORTIFICATIONS USED BY GERMANS

Captured German Machine-Gun Emplacement in Naked Timberland on the Western Front: The Walls are Built of Concrete, Brick, and Flagstones, and on the Fighting Side Are Four Feet in Thickness. Entrance to It is Gained through an Underground Doorway. Branches of Trees Cover the Roof to Shield It from the View of Airmen

Steel and Concrete Domes Extending only a Few Inches above the Ground Cover the Three Machine-Gun Pits Illustrated Herewith. Shafts Connect Each of the Positions with a Subterranean Ammunition Room, Which is Reached through a Communication Tunnel

The Strength of the Reinforced-Concrete Emplacements is Indicated by the Picture Above, Which Shows a German Gun Silenced by the British. Apparently the Projectile Fell from a High Elevation, Thus Passing the Parapet in Front. The Explosion Wrecked the Cannon, but Did Little Damage to the Surrounding Walls

COURTESY OF L'ILLUSTRATION

Some New Trophies Collected by the French: In the Foreground are Shown Several German Mine Throwers of a Late Pattern Used Effectively on the Western Battle Front. Their Design Is Quite Odd and Therefore Interesting. In the Background Are Ordinary Field Pieces

THE THREE TOP VIEWS ARE REPRODUCED FROM THE SPHERE, LONDON. COPYRIGHTED IN THE UNITED STATES BY THE NEW YORK HERALD COMPANY

SEMAPHORES USED TO STOP AUTO STAGE

Semaphores have been installed at stations along the route of a western

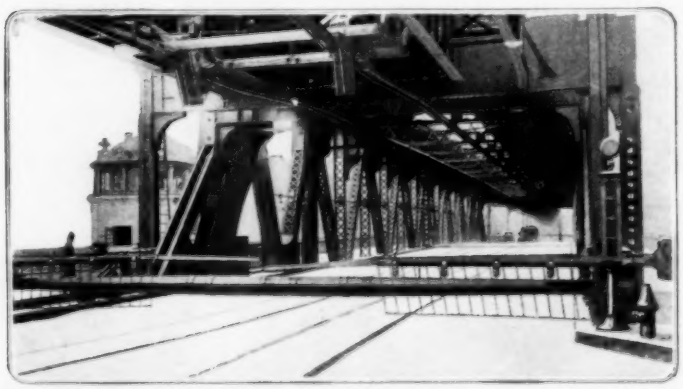
Station on an Auto-Stage Route in the West Showing Semaphore in Front, by Which Drivers are Apprised of the Presence of Waiting Passengers

auto stage as a means of signaling drivers to stop and take on passengers. The pivoted arm, with the word "Stop" painted on it, is drawn into a horizontal position by a wire and often saves a driver much uncertainty as to whether he should halt on his swift journey.

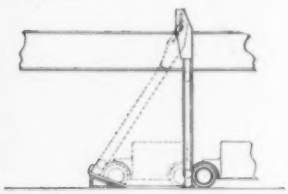
¶The government's foresters are urging more extensive use of fuel wood from the national forests next winter, in order that a possible coal shortage may be experienced without hardship.

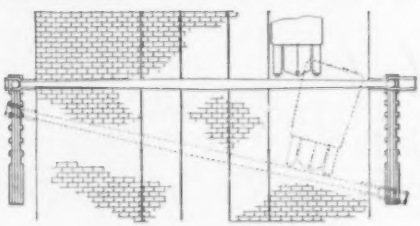
YIELDING BUFFER GUARDS AGAINST BRIDGE MISHAPS

A 1,000-lb. movable buffer of fir, which has been erected across the approach to a Chicago bridge of the double-deck bascule type, is a new safety device designed to keep vehicles from plunging over the end of the approach when the bridge is open. The ends of this beam travel in vertical tracks that hang like pendulums from the overhead structure, at either curb. When the bridge is about to open, leaving a well between the approach and the upraised section, the buffer, which is counterweighted, is lowered to the street. Special switches have been provided to permit it to pass the overhead trolley wires. An important problem has been solved by building this safety device so that it will bring vehicles to a halt gradually rather than instantaneously, as would be the case if it were rigidly anchored. In case the beam is struck it rolls backward, on wheels at either end, for about a foot. Then its motion is changed to sliding, tracks 15 ft. long being provided along the curbs. These are curved upward at their ends to stop the progress of the beam.



The Heavy Buffer is Shown Just Back of the Safety Gates: The Beam with Its Supports Weighs About Two Tons, and It is Stated That It will Stop a 4,000-Pound Car, Running 30 Miles an Hour, without Accident to the Occupants

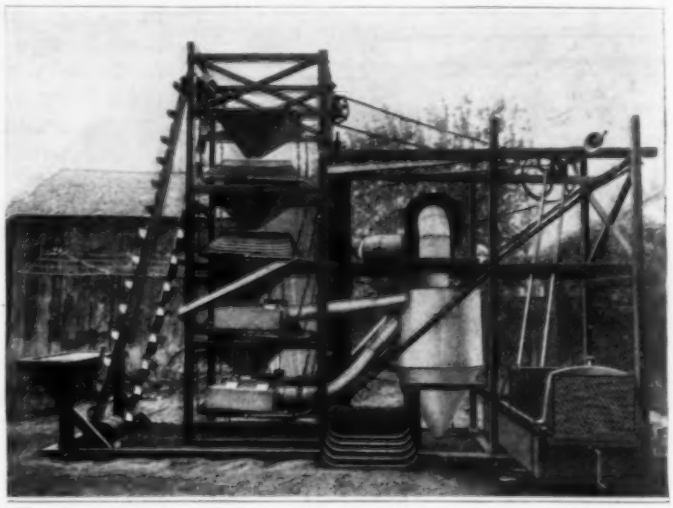




Plan and Side Elevation of Boom, Showing Its Action in Stopping a 4,000-Pound Auto Truck Running at 30 Miles an Hour

ORE SEPARATOR FOR USE IN DESERT GOLD MINING

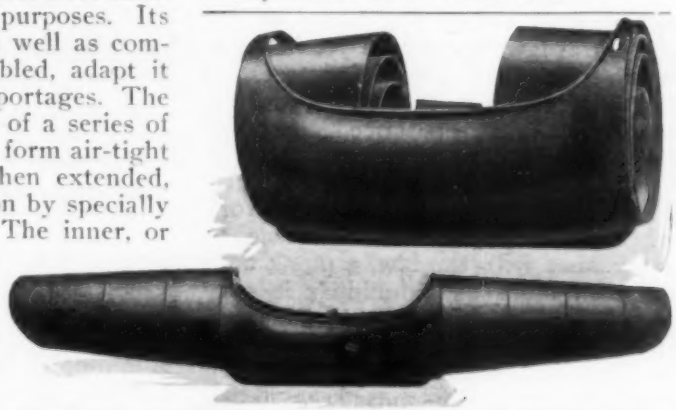
To meet the difficulty presented by placer mining in a region where water is scarce, an ore separator has been built recently which operates with dry gravel only and is said to separate 90 per cent of the gold from the pay dirt. After the gravel has been screened it is carried from a hopper by an endless conveyor to the uppermost of a series of slotted screens so placed that each discharges into the one beneath it. The screens are provided with several riffles to catch the gold and are made to vibrate through irregular orbits by eccentrics with which they are connected. The lowest screen is provided with a suction draft which aids in the separation. The same is true of the plate into which it discharges and on which the gold is caught by mercury held in place by riffles. The screens can be easily removed when it is desired to empty the gold from the riffles. This dry washer can handle from 50 to 100 cu. yd. of gravel per day and is driven by a 20-hp. engine.



Dry Washer Built to Overcome the Difficulties of Placer Mining in Deserts and Other Regions Where Water is Scarce: The Gold is Separated from the Gravel by Means of Riffles on Slotted Screens, with the Aid of Suction Air Drafts and Mercury

TELESCOPING STEEL BOAT STANCH AND PORTABLE

Sheet metal is the material used in the construction of a nonsinkable, collapsible boat that is intended for military as well as sporting purposes. Its strength and rigidity, as well as compactness when disassembled, adapt it for hard usage and long portages. The craft consists essentially of a series of telescoping sections that form air-tight compartments which, when extended, are held firmly in position by specially designed locking rods. The inner, or large, end of each of the members is sealed by a partition, and leakage prevented by packing rings, for which exterior grooves are provided. The central hull section tapers and has a keel attached to it, while open-bottomed stabilizing shells are permanently fastened to the sides.



Locked in Place, the Separate Sections Form Air-Tight Compartments. When Telescoped, They Fit Compactly within the Central Hull Member

ROPE NETS FOR PROTECTION OF STRUCTURAL WORKERS

During the past year the lives of several Illinois workmen, employed in the erection of tall structures, were

The Safety Nets Pictured Here Were Supposedly the First to be Used in Structural Work: They were Employed at Chicago and Saved the Lives of Two Painters

saved through the use of rope nets. In some instances precautionary measures of this kind were taken by contractors at the suggestion of state factory inspectors, and, in other cases, at their own initiative. A bill to compel the utilization of nets when men are engaged at dangerous heights, was introduced in the legislature, but aside from the general safety provisions of the structural law, no statute yet in effect requires their use. Thus it is interesting that the results of this casual and essentially voluntary practice have spread to California. The Industrial Accident Commission there has ordered that nets be used on all structural work when it is not practical to provide, in accordance with the law, a plank floor for each story as a building is constructed. The moderate cost of nets and the readiness with which they may be installed, make them especially suitable for safety purposes. They were used successfully in Chicago during the erection of high steel-arch trusses at the municipal recreation pier, were employed in bridge work on the Mississippi River adjacent to Burlington, and have been tried elsewhere on a number of occasions. Nets with 6-in. mesh, made of ⅝-in. Manila rope in 20 by 40-ft. sizes, were utilized at the Chicago pier. It is encouraging to those who appreciate the need of protecting workmen engaged in dangerous occupations that the use of all except wire rope, for the slings and stirrups of swinging scaffolds, has been prohibited in Illinois. Strict rules governing the construction of such devices are in force.

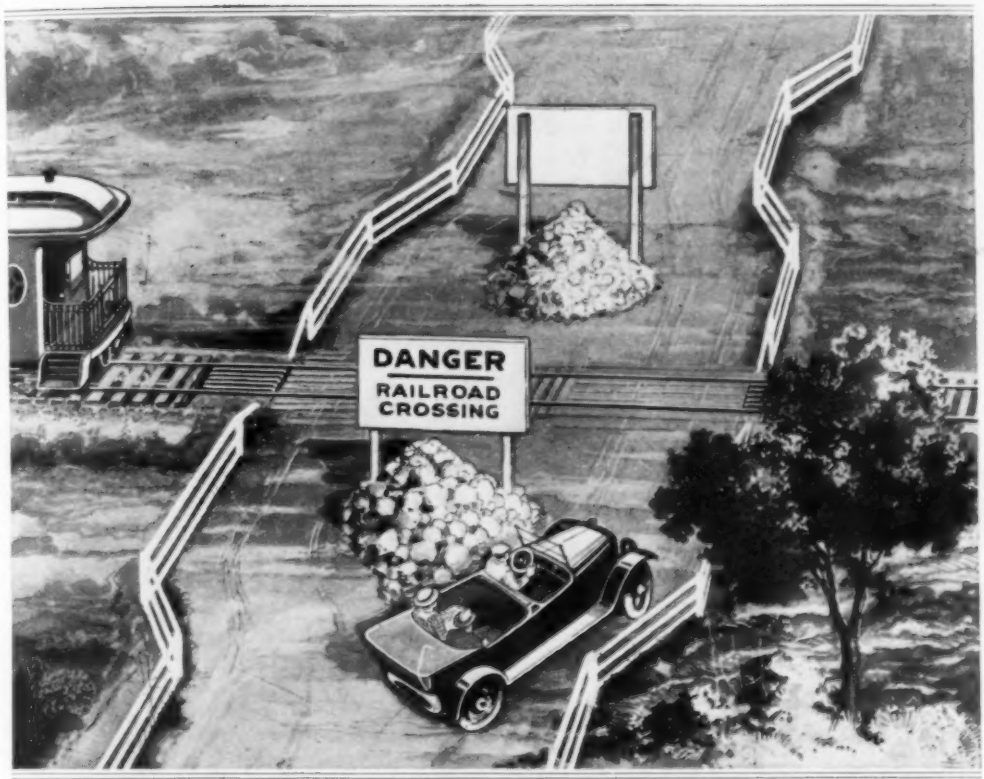
TRIM CRUISER SETS RECORD DURING MAIDEN TRIALS

During tests conducted over a measured course a few weeks ago, a specially built 40-ft., single-screw express cruiser showed exceptional speed. Powered with an eight-cylinder engine that develops about 325 hp., it attained 35.46 miles an hour with 12 persons aboard. This capacity for covering distance is believed by the builders to be greater by five miles an hour than that of any single-screw craft of similar type ever launched. The boat weighs about five tons, exclusive of equipment, fuel, and passengers, has an 8½-ft. beam, and is of very stanch construction. It offers sleeping accom-

This Little Express Cruiser Cut through the Water at 35 Miles an Hour during Its First Tests

modation for three persons, possesses a 20-ft. deck, and is exceedingly trim.

¶There were 1,067,332 more registered automobiles in 1916 than in 1915, an increase of 43 per cent. The gross total last year, including commercial cars, was 3,512,996.



A Grade Crossing That Promotes Safety: Sketch Showing Manner in Which It is Proposed to Alter all the Grade Crossings in a Missouri County so That No Vehicles can Cross Tracks Except at Low Speed

SAFE GRADE CROSSINGS FOR WHOLE COUNTY

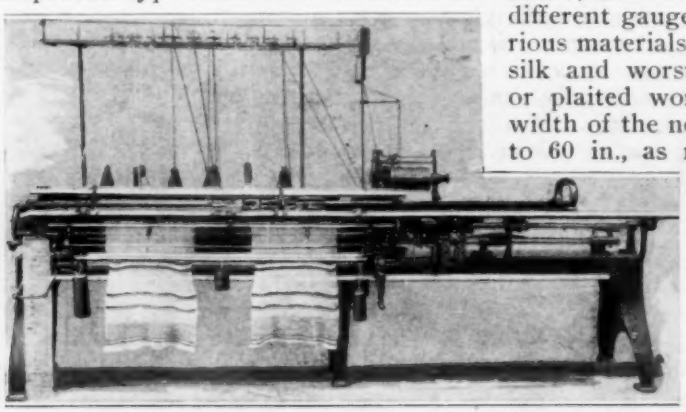
Steps have recently been taken to make all the grade crossings in Jackson County, Mo., "fool-proof"—that is, a plan has been adopted which will compel each vehicle to slow down on approaching a railroad track and so materially lessen the probability of accident. The improvement, which will cost about $300 per crossing, consists in widening the roadway at its intersection with a railway and placing a pile of stones, or fencing off a triangular plot, in the center of each approach, thereby dividing the road into two parts, one for traffic going each way. Signs and white fences built close up to the path of travel call attention to the turns in the road. With this arrangement each vehicle must approach a crossing slowly in order to turn out of the straight course and to get back into it, after passing over the tracks. In this way drivers are given time to look for approaching trains.

EMERY WHEEL ATTACHED TO SEWING MACHINE

A simple attachment by means of which a sewing machine can be employed to operate an emery wheel or similar device for household use, consists of a shaft extending through two crossed plates that can be clamped to the flywheel of the machine. A sharpening or polishing stone can be firmly mounted on the shaft, which revolves with the flywheel when the treadle is operated.

FULL AUTOMATIC POWER KNITTING MACHINE

An automatic knitting machine of improved type has been introduced in this country by its Swiss inventors, and is claimed to be as nearly automatic as such a machine can possibly be, in the manufacture of sweaters, scarfs, and similar knit goods. With different gauges it can be used for various materials, including silk, artificial silk and worsted, wool and worsted, or plaited worsted and cotton. The width of the needle bed varies from 10 to 60 in., as required, and its gauge from 3 to 18 needles per inch. One of the special features is an automatic counting device whereby the machine makes different sizes of a garment without resetting. A single operator can take care of four to six machines, minimizing labor costs.

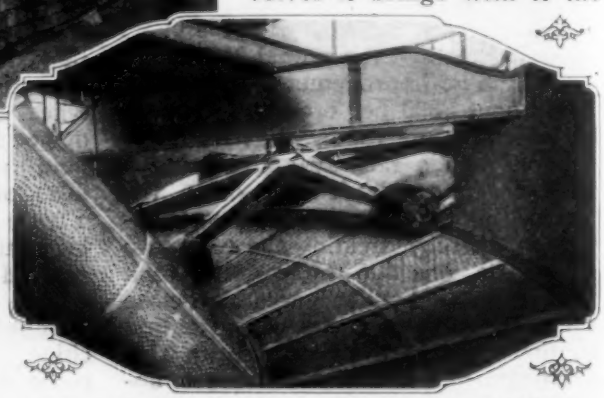


Automatic Knitting Machine for Making Silk or Wool Sweaters and Scarfs: It Uses Little Power and Requires Little Care When in Operation

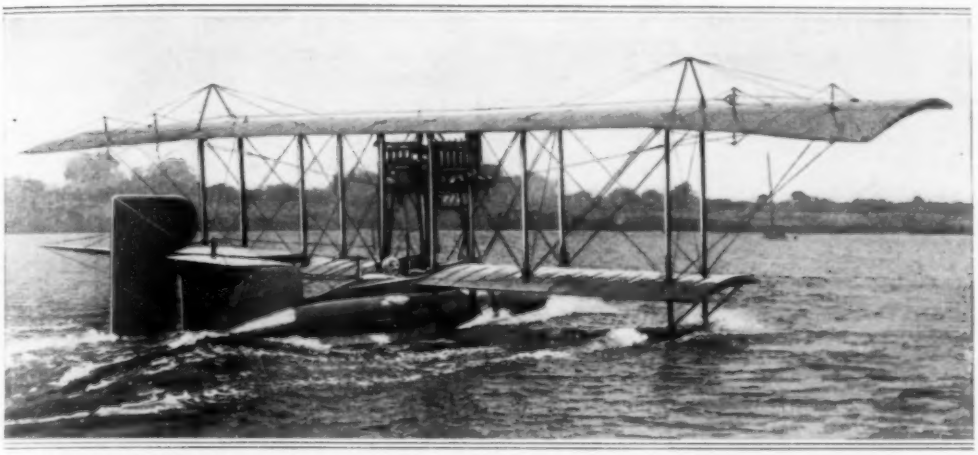
FOREIGN SEWAGE-TREATING PLAN ADOPTED HERE

A new type of sewage-treating plant, which, it is claimed, can be built within city limits without being offensive to those in its vicinity, has been introduced into three American cities from Europe, namely, Brooklyn, Cleveland, and Long Beach, Calif. It has the special advantage of occupying a small area, and it is asserted that the effluent from the plant can be discharged into local waters without creating a nuisance. The method of treating the sewage is mechanical, a revolving screen being employed to separate the solids and liquid. The separator is a large disklike plate in the center of which rises a cone. Both are of noncorrosive metal and are closely perforated with narrow slits 2 in. long. The screen is tilted at about 15° from horizontal so that one side is submerged in the sewage flow. As it slowly revolves it brings with it the

Special Bins Filled with Sewage Screenings Which, in France and Germany, are Sold for Fertilizer



View of the Revolving Screen That Separates the Solid Matter from the Fluid Sewage, and the Rotating Brushes That Discharge It into Troughs



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When the Boat Attains Speed, It Planes on Its "Third Wing" with the Hull Raised Out of the Water

solid matter, which is brought under a set of brushes that rotate on an iron spider and also revolve on their axes. These continually brush the sludge off into troughs, and it is eventually burned, reduced or used as fertilizer, according to its chemical content. As it comes from the screen troughs it is bagged and placed in a rotator which expells the water by centrifugal force.

LIGHT-WEIGHT FLYING BOAT BUILT FOR PLEASURE USE

Distinctive features are incorporated in the body design of a sport-type flying boat that has been given extensive tests in eastern waters. The streamline hull is unusually light and is circular in section. Below it is a plane, or third wing, on which the craft skims on the surface of the water. Owing to this form of construction, it is claimed, the head resistance of the vessel amounts to only a little more than that of the ordinary land tractor. The boat is able to plane on the water with its hull entirely clear, while, in alighting, the body is not subjected to the entire shock, for the wing struts are made to bear a proportionate share of it. These points permit the hull to be nearly 300 lb. lighter than that of a standard craft of similar length. It has been found that the boat's design materially facilitates its control and that it can be handled on the water almost as easily as a motorboat. Such advantages are of importance to the sportsman flier, for they tend to make the craft independent of its hangar and enable it to be anchored wherever the water is sheltered. The machine is known as the Pierce-Breese flying boat and is rated to travel at a speed of from 40 to 50 miles an hour. The upper wing has a span of 48 ft., and the lower member, 31 ft. As a test, the boat was anchored for five months in salt water. During that period the hull did not leak or become logged, nor did any other sign of deterioration appear.

NONREFILLABLE BOTTLE OF NEW DESIGN

A nonrefillable glass bottle of inexpensive design is provided with a neck, shaped like an inverted cone, in which is a glass ball that closes the opening at the lower end of the neck. After filling the bottle and inserting the ball, a flanged glass tube is cemented into the mouth so that the ball valve cannot be dislodged to permit refilling the container.

MOTOR-DRIVEN SIREN OF NEW TYPE

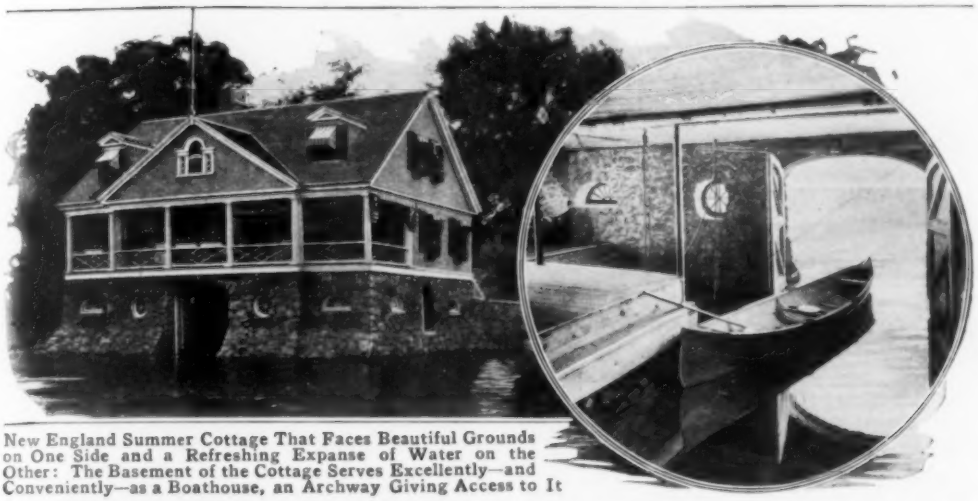
A recently devised siren for fire-alarm or signal purposes which can be heard great distances is motor-driven and is provided with turbinelike vanes that produce a weird sound as they rapidly revolve. The noise is greatly magnified by a horn, attached to the top of the apparatus, which projects horizontally and swings slowly around in a circle, while the siren is in operation. By means of a hand-operated slide in connection with the apparatus the sound can be varied at will, or a trained operator can transmit messages with the signal by using a telegraph code.

New Type of Siren Which is Driven by the Motor Shown at the Right: While the Signal is in Operation the Horn, Which Greatly Magnifies the Sound, Swings Around in a Circle

FELLS GAME WHILE RIDING SWIFTLY ON MOTORCYCLE

The feat of the horseback rider of cowboy days who could kill game or an enemy while riding full tilt, is equaled, if not surpassed, by a naturalist and taxidermist who shoots some of his quarry while riding at high speed on his motorcycle. He has devised a clamp to hold his loaded shotgun above the gasoline tank of his cycle, while a sling attached to the weapon passes over his shoulder. His method is to ride swiftly along the road and, when he sees a desirable bird perched near the highway, he seizes his gun and fires upon it without slackening speed. This, of course, involves skill in riding without touching the handlebars. By this spectacular method the naturalist is able to fell birds which would take flight if approached by stealth.

Skillful Motorcyclist Riding at Full Speed and About to Fire at a Bird Perched by the Roadside: This Bird Is a Stuffed Specimen Which was Killed in the Manner Shown While Sitting on This Very Post



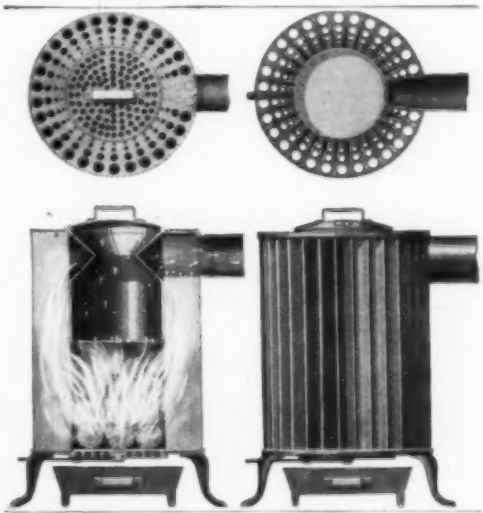
New England Summer Cottage That Faces Beautiful Grounds on One Side and a Refreshing Expanse of Water on the Other: The Basement of the Cottage Serves Excellently—and Conveniently—as a Boathouse, an Archway Giving Access to It

PLEASING SUMMER COTTAGE IS BUILT OVER WATER

Those who love the water and enjoy living near it will appreciate the attractive features of a pleasing New England summer cottage whose basement serves as a boathouse for the owner. On one side the residence faces inviting grounds, and on the other clear, rippling water that to the devotee of aquatic pastimes is equally enticing. The structure is carried on artistic stone walls extending out from the shore of the lake. A large archway with double doors permits boats to enter the basement, where low landings give access to stairs leading to the floor above.

STOVE OF NEW DESIGN HAS LARGE HEATING AREA

A great saving in fuel, it is claimed, can be made by using a new type of stove, whose outward dimensions are not greater than an ordinary heater, but which has four times as much actual radiating area. This stove has an outer and an inner wall, the latter, which surrounds the fire pot, being composed of numerous convolutions arranged radially. Air enters between the two walls through holes in the bottom of the stove and, on being warmed, passes out through the top and sides, which are perforated. Fuel is supplied through a central opening in the top for which a lid is provided. Extending downward from this opening to well within the reach of the flames, is a drum in which water may be kept. This chamber serves to spread the flames, forcing them against the vertical walls. Air for the draft enters through an adjustable grate in the bottom of the stove and, together with smoke and gases, passes out through a flue situated at one side, near the top.



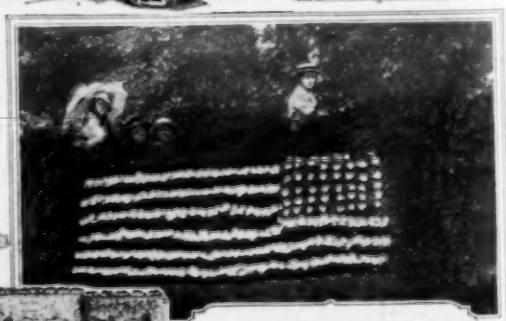
The Convolutions in the Inner Wall of This Stove Give It Four Times as Much Radiating Area as an Ordinary Stove. Air Enters at the Bottom, Rises between the Outer and Inner Walls, and Passes Out through the Top and Sides

PATRIOTIC AND OTHER BEAUTIFUL DISPLAYS WERE

The Eleventh Annual Rose Festival Held Recently in Portland, Oregon, was Not Lacking in Patriotic Appeals, Presented in Various Forms. One of the Most Enthusiastically Applauded Sections of the Beautiful Children's Parade Was That Devoted to the Red Cross. The Long Rows of White-Clad Girls, Each Wearing the Red Emblem of Mercy on Her Forehead and Breast, Presented a Spectacle That Was Very Impressive. Back of the Applause Was the Silent Recognition of the Fact That the Red Cross was Soon to Mean More to America Than Ever Before

Not to be Outdone by the Big Gasoline-Driven Automobiles, This Little Negro Boy Shared Merrily in the Parade, Pumping Along in His Geared Wagon, the Flowers Almost Enveloping Car and Rider

Very Appropriately, a Replica of the Goddess of Liberty was Made the Central Decorative Feature of the Festival. The Statue, 50 Feet in Height and Weighing Four Tons, was Erected in Festival Center, a Beautifully Gardened Area Composed of Several Blocks. At an Appointed Time the President in Washington Pressed a Button Which Turned on the Many Lights Studding the Statue



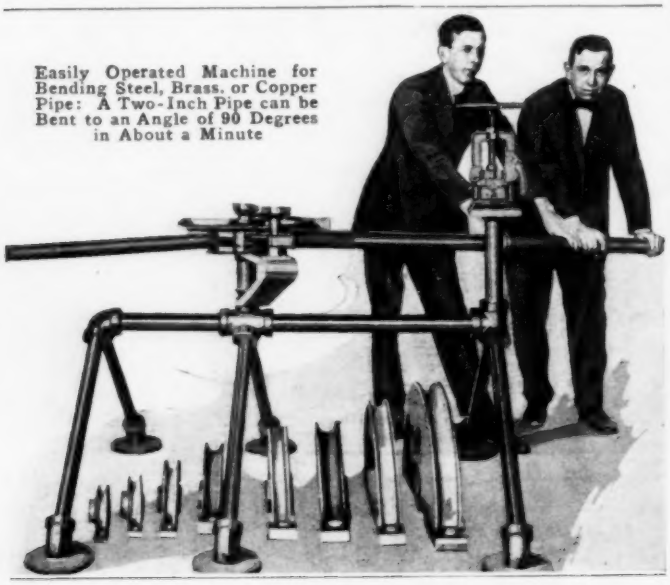
The Automobile Which Received the Prize of $75 for the Distinctiveness of Its Decoration: The United States Flag was Made of Delphiniums and Red and White Carnations, Set in a Field of Scotch Broom

FEATURES OF PORTLAND'S RECENT ROSE FESTIVAL

One of the More Pretentious Entries: This Embowered Car Well Illustrates How Gorgeous and Elaborate Are the Floats Prepared for the Annual Festivals. It Represented a Horn of Plenty, the Horn Itself being Made of Carnations, Easter Lilies, and Snowballs. Overflowing from the End of the Horn Were Quantities of Roses Which Completely Covered the Front of the Automobile. Surmounting the Hood Was a Bird Composed of Red and White Carnations

PIPE-BENDING MACHINE ELIMINATES JOINTS

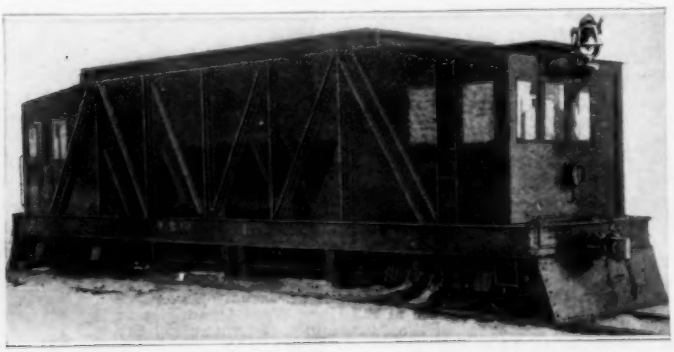
Pipe bending, which has long been considered a task difficult to perform without cracking or crimping the tubing, can now be accomplished, it is claimed, by unskilled workmen with cold material, by using a new bending machine. This machine is mounted on a knock-down steel frame and is provided with a set of removable heads of various sizes, each of which resembles a half of a solid pulley, the curved edge having a hollow groove in which the pipe lies when its shape is being altered. The head used corresponds in size to the pipe to be treated. To operate the machine the pipe is inserted between the head and a set of jaws. By means of a long lever, which projects horizontally, pressure is exerted on the pipe to force it gradually around into the groove of the head, thereby producing a bend of the angle desired. A 2-in. pipe can be bent to a 90° angle in about a minute. The bender effects an important saving of material by doing away with cutting and the use of threaded joints of various types.



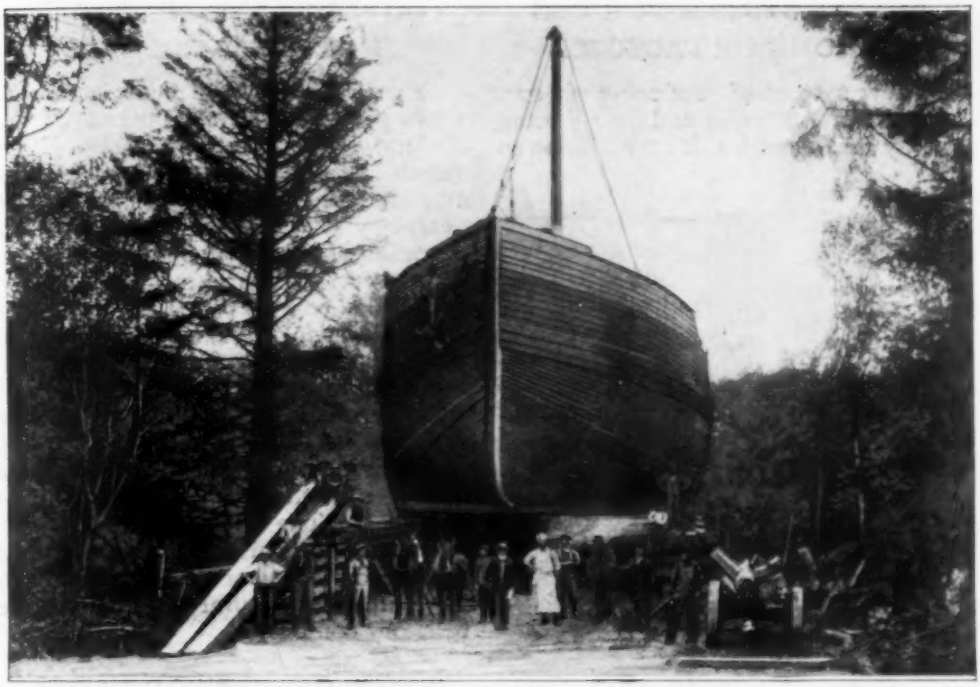
Easily Operated Machine for Bending Steel, Brass, or Copper Pipe: A Two-Inch Pipe can be Bent to an Angle of 90 Degrees in About a Minute

NEW ORE-TRANSFER CAR OPERATES QUICKLY

A feature of a new 50-ton transfer car for ore and limestone, made by a Cleveland builder, is that it can be emptied in a few seconds by operating one or both pairs of motor-driven hopper gates, with which it is provided. These gates are of the rolling type and when rolled open leave a large, clear passage over the center of the track. They will cut through a pile of material and close up when a bin is not large enough to care for an entire load. The car has two cabs, one at each end, in which center all controlling apparatus. Here also are dials showing the position of the gates. The length of the car is 42 ft. It is driven by four 60-hp. motors, and is of the best type of steel construction throughout.



This 50-Ton Transfer Car for Ore or Limestone can be Emptied in a Few Seconds by Operating the Hopper Gates, of the Roller Type, with Which It is Provided



Barge Weighing 1,200 Tons being Drawn from the Place Where It Ran Ashore to a Quiet Bay Over Half a Mile Distant, Where It was Launched with Safety: A Donkey Engine on Board the Boat Aided in Making the Transfer

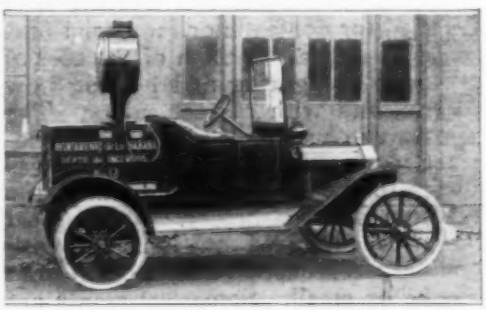
STRANDED BARGE JOURNEYS HALF A MILE OVERLAND

Following the beaching of a barge weighing 1,200 tons, during a storm on the Pacific coast a few weeks ago, that vessel was given an overland trip of half a mile in preference to putting it back into the water where it had grounded, the fear being that the breakers might dash it to pieces. By making the land journey the boat was brought to quiet water where launching was accomplished with entire safety. The transfer was made by jacking the barge up and moving it on rollers along an especially constructed track. To provide a level path, deep cuts had to be made in places.

¶Because pork can be used in a great variety of ways, will keep better than most other meats, and can be quickly produced at a relatively low cost, the government is strongly urging farmers to raise more hogs and thereby add to the nation's food supply.

MOBILE LIGHTING EQUIPAGE AIDS CUBAN FIREMEN

To be of assistance in emergencies at night, a searchlight that projects diffused rays has been installed on a small roadster for the municipal fire department of Havana, Cuba. The light is mounted on top of a two-compartment steel box—intended for batteries and equipment—that is attached at the rear.



Mobile Searchlight Equipment of the Havana, Cuba, Fire Department: The Box below the Light Contains Electric Batteries and Other Equipment

AIR-GAS SYSTEM FOR USE IN HOME OR FACTORY

A new system of producing air gas, invented in Australia and just finding its way into America, is stated to be so

Apparatus for Producing Air Gas, for Domestic or Industrial Lighting and Heating: The Gas Includes a Small Portion of Gasoline Vapor, Mixed with Air

simple in process and so compact in mechanical proportions that a plant may be installed to furnish light and heat in the average dwelling within a floor space of 5 by 6 ft., at a probable cost of $125 to $150 for installation. Essentially, the system consists in producing gas by mixing small quantities of gasoline vapor with large quantities of air. The proportions are 98½ per cent of air to 1½ per cent of vaporized gasoline. This gaseous mixture may be used for domestic or industrial purposes at a small fraction of the cost of methods of lighting and heating now in use, and with perfect safety. The apparatus consists of a patented vaporizer and carburetor, supplying gas direct to the service pipe without the medium of a gasholder. A hot local flame is produced on ignition, with complete combustion and freedom from smoke or smell. Some 300 plants are said to be in successful operation in Australia.

GOVERNMENT PULP MILL IN ALASKA PROPOSED

A pulp mill for the manufacture of news print will be established by the Federal government in Alaska, if the recent petition of the Alaska legislature and the recommendations of the secretary of agriculture are acted on favorably by congress. According to forest-service experts news print made in Alaska could be delivered to New York City via the Panama Canal and sold at not more than $30 per ton, whereas this product at the present time is selling for $60 per ton. There are 70,000,000,000 ft. of spruce and hemlock in the national forests, besides timber on other public lands, in the territory. The secretary of agriculture is of the opinion that greater riches will be derived from this source than from all other natural resources in the territory combined.

SWISS CASKET TOO LARGE FOR AMERICAN HEARSE

A massive burial casket was recently shipped to this country all the way from Switzerland, and on arriving here, had to be discarded for a smaller one because its height did not permit it to be loaded into an American hearse. The coffin was made of hand-carved quartered oak, was lined with copper ⅜ in. thick, and weighed about 1,200 lb. The retail price paid for it was

Massive Casket of Quartered Oak, Weighing About 1,200 Pounds, Which was Recently Shipped to This Country and Then Discarded Because It could Not be Loaded into an American Hearse

$2,700. This casket is said to have been similar in design to the one in which the late emperor of Austria was buried.

Wife and Child of Guano Gatherer in Their Cave Home: The Wife is Weaving a Panama Hat

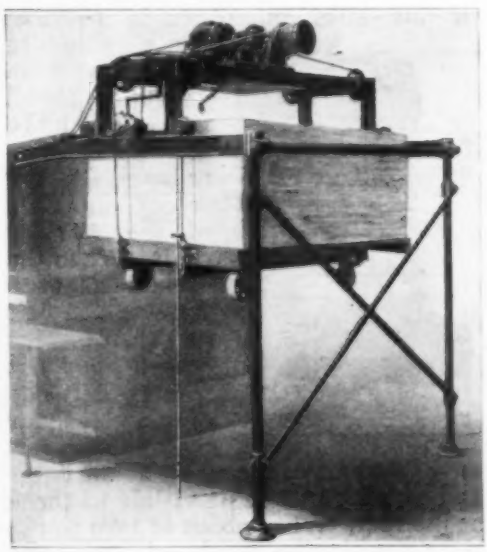
Above Is a General View of the Mouth of the Cave Dwelling, Partly Closed with Thatch, and at the Left Is a View from the Interior of a Cave Estimated to Contain 35,000 Tons of Guano

GUANO GATHERERS LIVE IN ISLAND CAVE

Numerous caves, one of which serves as a human habitation, and others of which are rich in deposits of bird and bat guano, are to be found on Mona Island, a little body of land lying directly west of Porto Rico and belonging to that territory. The deposits of fertilizer are the accumulation of countless years and are now attracting Americans who are exporting the guano in large quantities. One cave recently opened is estimated to contain 35,000 tons of deposit.

PAPER HOIST SAVES TIME IN PRINTING PLANT

Most of the labor and time usually consumed in lifting paper stock to the top of a flat press in a printing establishment, are saved through the use of an elevating mechanism that is now being adopted. A steel framework, carrying a motor and hoisting outfit, is attached at the feeding end of a press. The paper is moved beneath it on a small truck. Cables are then attached to the latter and power applied. When the top of the stack reaches the desired height, the hoist stops. As the feeder removes the paper, the remainder is raised automatically so that the stack is maintained at the proper elevation until exhausted.



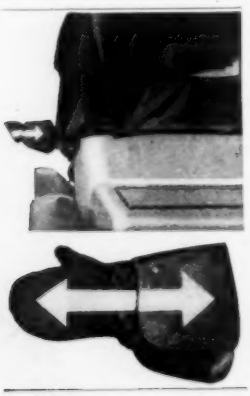
Showing One of the Paper Elevators, Attached to a Flat Press, in Actual Use

NEW MALTED-MILK MIXER HAS PORCELAIN SUPPORT

An attractive feature possessed by a new malted-milk mixer for soda fountains is a combined base and column which is a single unit of white porcelain that can be easily kept clean. The motor is stationary, being mounted on the top of the column. The mixing spindle can be raised 7½ in. so that even a very tall container can be placed beneath it. Current is turned on and off by lowering and raising the spindle, which will operate only when at, or near, its lowest position, and so does not splash liquid on being inserted into or withdrawn from a glass.

ARROW PAINTED ON GLOVE SERVES AS AUTO SIGNAL

Merely by painting a double-headed white arrow lengthwise on the back of his left-hand glove a motorist has provided himself with an effective signal for use while driving. The two arrowheads are at opposite ends of the arrow shaft. When the driver is about to turn to the left he thrusts his gloved hand out from the left side of the car far enough to permit only that part of the arrow at the outer end of his glove to be visible to those at the rear. When about to turn to the right he thrusts his hand somewhat farther out, with the fist closed. This leaves visible only the arrowhead pointing to the right. "Stop" is indicated by holding the forearm and hand in a vertical position.



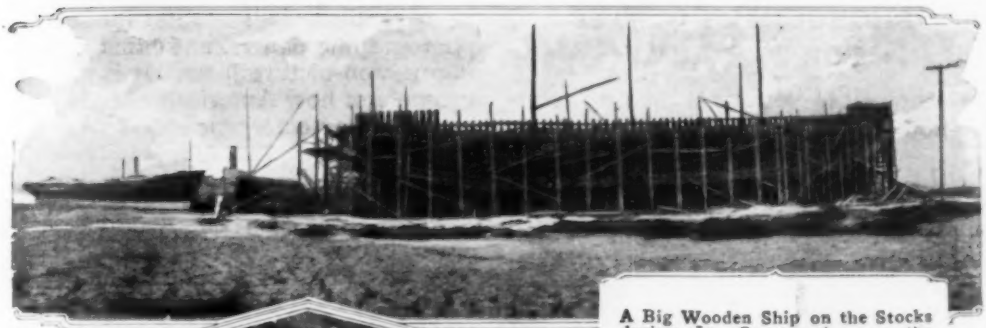
MAKE WATER TANKS SQUARE TO MATCH OUTBUILDINGS

Consistency in architectural design has been carried to such an extent in the construction of the buildings on a California ranch that the two water reservoirs included among the outbuildings have been made square and in a style that harmonizes in other respects with surrounding structures. Within each of the two square towers is concealed a cylindrical tank in which the water is kept. The outer structure, in addition to giving the desired appearance, helps to keep the water cool and prevents warping of the reservoirs.

NOVEL HAIR CUT LEAVES RED CROSS ON TOP

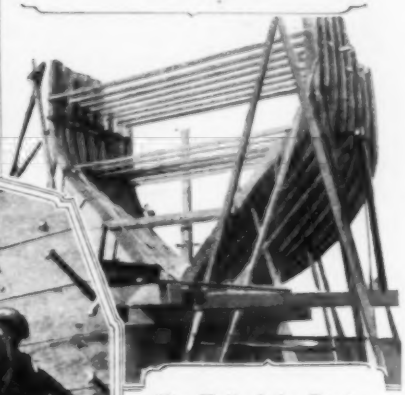
During a recent Red Cross campaign a young man having red hair decided to show his patriotism and advertise the cause, in which he was much interested, by having his head shaved clean except for a large cross-shaped area on the top. As he tipped his hat and bowed, on meeting friends on the street, he was sure to attract attention.

BIG FIVE-MAST SCHOONER LAUNCHES ITSELF



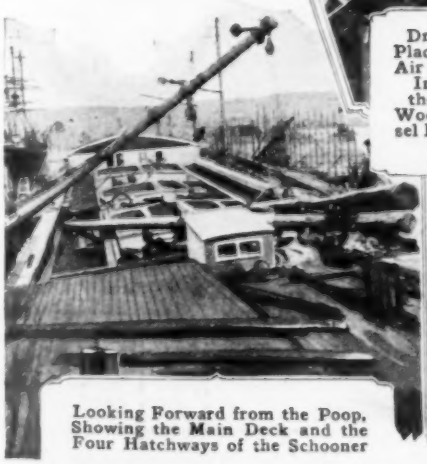
A Big Wooden Ship on the Stocks during Its Construction on the Pacific Coast: When Preparations were being Made to Launch It, the Vessel Broke Loose and Slid into the Water. This Unexpected Procedure Prevented the Christening of the Craft

Using Big Mallets to Start the Four-Foot Pins That Hold the Hull's Timbers Together: Four of Them, Two Wooden and Two Iron, are Used at Each of the Hundreds of Places Where the Planks Cross the Ribs



The Hull of the Boat is Constructed of Oregon and California Pine. This Picture Shows How the Ribs are Put in Place, One at a Time. The Ship Is 271 Feet in Length

Driving the Pins into Place with a Compressed-Air Hammer, One of the Important Stages in the Construction of a Wooden Hull: The Vessel Has a Cargo Capacity of 2,000 Tons

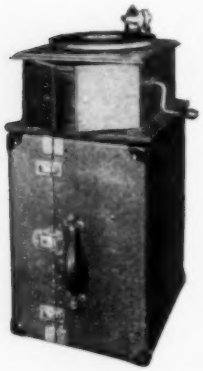


Looking Forward from the Poop, Showing the Main Deck and the Four Hatchways of the Schooner

Chipping Off the Edges of the Heavy Planks: The Men Who Do This Work are Followed by Planers Who Finish the Hull

PHONOGRAPH OUTFIT FOR THE ARMY

Among the various means of entertainment that are to be provided for the American soldier who enters this war, will be the phonograph. A special outfit has been devised for army purposes, consisting of a hornless instrument, and a waterproof fiber case. The latter is made like a suitcase, and is divided into compartments for the phonograph, 30 or more records, and extra parts, including needles. The weight of the outfit complete is about 36 pounds. In camp, the container, which is very substantial in construction, can be used as a standard for the instrument while it is being played.



NEW DEVELOPING PRODUCT TAKES PLACE OF METOL

A new photographic developer, said to be of reliable quality, has been placed on the market recently as a substitute for metol. The latter is a whitish developing powder which is made in Germany and is not now obtainable on account of the war. The new product is suitable for plates, photographic papers, and films, including motion-picture films. It is another example of how American chemists are meeting war emergencies.

SYNCHRONIZING APPARATUS FOR FLASH PHOTOGRAPHY

A recently devised attachment for actuating a camera shutter at the instant a flash-light powder explodes depends for its operation on the burning of a silk thread by the explosive. A plunger which is a part of this synchronizer projects up through the flash-light pan and is connected with the camera shutter by a wire that passes through a flexible tube. A coil spring at the lower end of the plunger tends to thrust the latter upward. However, when a picture is about to be taken the plunger is tied down by a silk thread stretched across its upper end. Any of the usual means for setting off the powder can be employed. When the explosion takes place in the pan the heat burns the restraining thread and allows the plunger to fly upward. This in turn pulls the wire, so that the shutter is operated at the instant the flash is at its maximum.

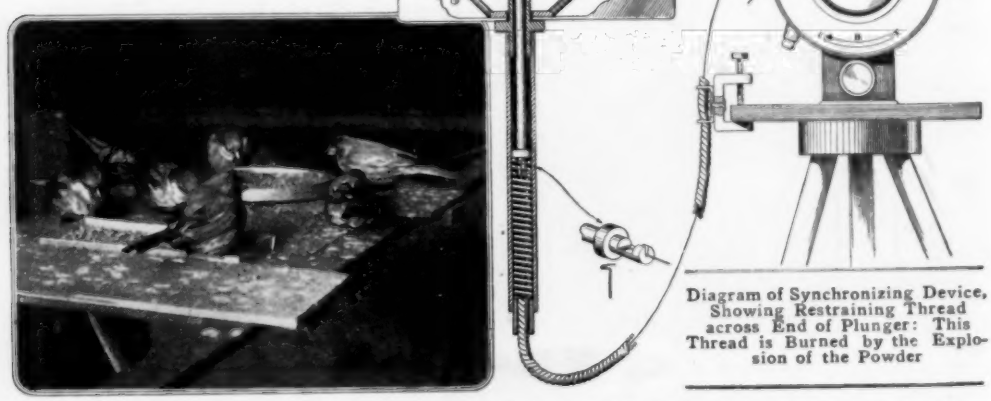
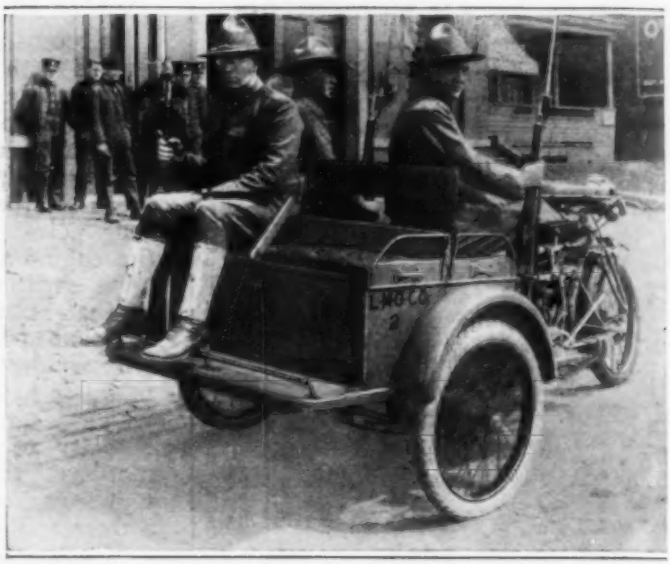


Diagram of Synchronizing Device, Showing Restraining Thread across End of Plunger: This Thread is Burned by the Explosion of the Powder

Birds Photographed by Flash Light, the Camera being Set for One Two-Hundredth of a Second and the Shutter Operated by a New Automatic Synchronizer

ATTACHMENT MAKES CYCLE FOUR-PASSENGER CAR

For military and police purposes a two-wheeled cart attachment for a motorcycle has been developed which is able to transport four men and a store of rifles and ammunition at high speed. It forms a four-wheeled vehicle that is very flexible, easily controlled, and convenient for emergency use. The seats are placed back to back, and beneath each is a storage compartment of proper length to receive firearms. Owing to the low fuel consumption of a motorcycle, the combination provides an economical machine.

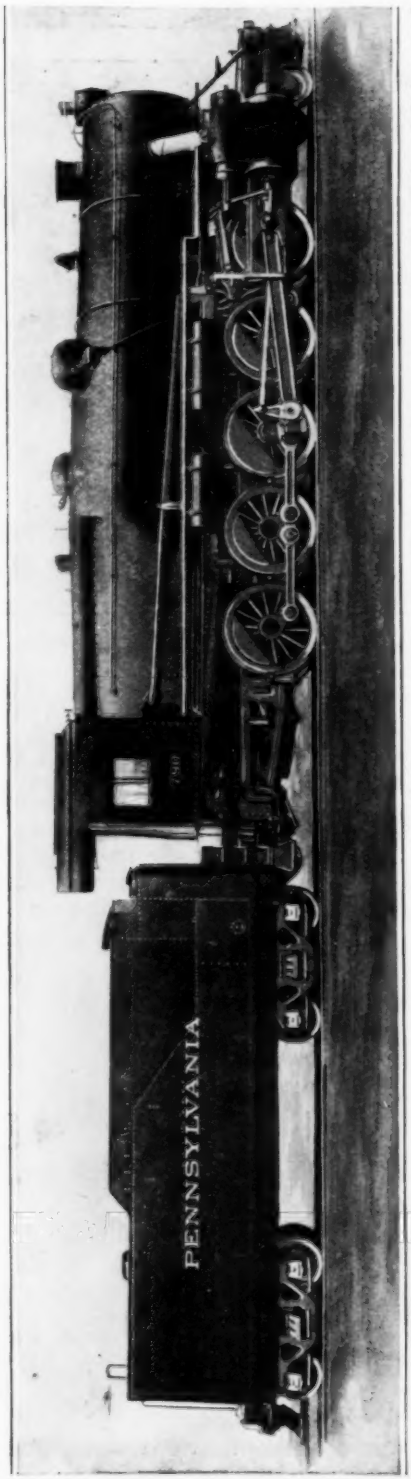


Showing a New Cart Attachment for Military or Police Motorcycles That Allows Four Men to be Carried: Under the Seats Is Storage Space for Arms and Ammunition

BOILER-FURNACE DEVICE AIDS COMBUSTION

Many owners of apartment houses, and other large buildings, are installing an appliance in their boiler furnaces which promotes better combustion by furnishing a better air supply to the burning fuel. The appliance can be installed in any low-pressure fire-box boiler, or return tubular boiler, having 1,200 sq. ft. or more of radiation. One feature consists of two perforated plates situated one at each front corner of the fire box, through which the air enters the fuel chamber. The other principal feature is a brick arch, or partition, that divides the upper part of the fire box into a front and back compartment. The former is kept filled with coal up to the partition. Air entering through the perforated plates is heated and, together with gases given off by the heated coal, passes through openings provided in the partition. These passages force the heated air and gas downward onto the burning fuel in the second compartment and thereby greatly facilitate combustion.

Diagrammatic View of Fire Box Showing Brick Partition Dividing It into Two Parts: Heated Air and Gases Pass through the Openings Down into the Burning Fuel and So Promote Combustion. The Perforated Plates are Not Shown



This Powerful Locomotive has been Constructed by the Pennsylvania Railroad for Experimental Purposes. It is Distinguished by Its Five Pairs of Drivers and Marks an Interesting Trend in Current Designing. Because of the Number of Its Driving Wheels, It is Known as the Decapod Type. This Feature Makes It More or Less Uncommon, but Not Unique. Engines of Similar Character are being Used by Certain Other Companies

BIG LOCOMOTIVE PROVIDED WITH TEN DRIVING WHEELS

In recent weeks tests have been conducted with an interesting locomotive that has been developed for experimental purposes by the Pennsylvania Railroad. It is of the "decapod type," having five pairs of driving wheels instead of the more customary set of four pairs. This arrangement gives the engine additional traction and enables greater utilization of its power so that starting and stopping are accomplished more smoothly than otherwise would be the case. The boiler is designed to carry a pressure of 250 lb., which is an increase over the usual capacity of the company's big locomotives. It is equipped with a 48-unit superheater and has 244 two and a quarter inch flues, 228 in. long, between the tube sheets. The area of the fire grate is 70 sq. ft., while the total heating surface of the boiler amounts to 6,494 sq. ft. The wheelbase of the engine and its tender is a half inch more than 73 ft. The driving wheels have a diameter of 62 in. The forward and rear sets are flanged, but the others are not. For the driver brakes two air cylinders, capable of exerting a braking power of 230,000 lb., are used. This is understood to be the largest locomotive that has been designed by the company. Primarily it is intended for freight service.

SPECIAL WAY OF PACKING MATCHES WITH CIGARS

According to the terms of a recent patent, each cigar can be provided with a match so that a smoker need suffer no inconvenience in obtaining a light. The match is to be incased in a waterproof wrapper and imbedded in the butt of the cigar at the time the latter is made. The end of the wrapper will project from between the tobacco leaves and can be withdrawn easily. It is claimed that the cost of this feature would be small, as the work can be done mechanically.

"TRENCH TRAPS" OF THE GERMANS

By LEWIS R. FREEMAN

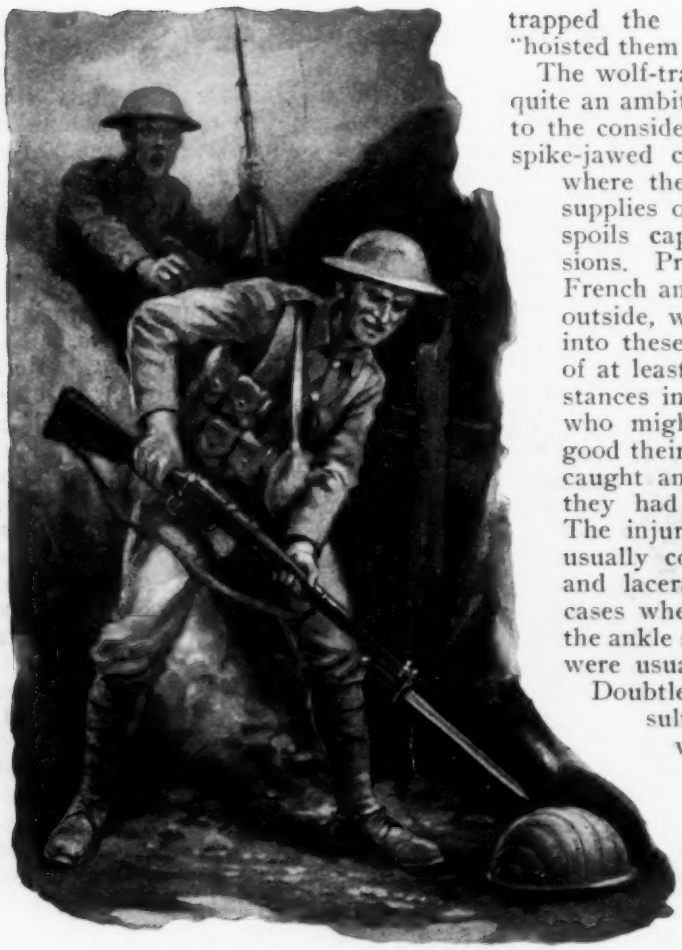
"WHAT do you think made that wound?" asked an officer who was conducting me through one of the advanced hospitals on the Somme, pointing to the badly swollen and lacerated ankle of a soldier that was just being dressed. The puffy and discolored flesh might have come from a severe sprain, but two or three black punctures on either side indicated that the injury was a more aggravated one. "If there was a tropical river about," I replied finally, "I should hazard a guess that the man had stepped into the mouth of an alligator, or had been nipped by one while swimming. As I have never heard of alligators in the Somme, I fear I shall have to give it up. What *did* do it?"

"Trench trap," was the laconic reply; "or, to be more exact, a wolf trap. Ever since the steady pressure of our advance began to tell—since the Boche began to realize that he would have to continue backing up before our attacks—the Germans have been leaving them behind in the trenches, or laid in inviting little runways through the wire entanglements. Not many of our men were caught after the first day or two—we have only had two or three cases here—but several scores of traps have been discovered, along with a lot more of diabolically ingenious contrivances designed to hamper our advance or to give us pause in the matter of occupying abandoned dugouts. In fact, the dodging of the trench traps has added quite a new interest and zest to our latest attacks."

"'Trench trap,' was the laconic reply. . . . 'The Germans have been leaving them behind in the trenches, or laid in inviting little runways through the wire entanglements.'"

Scientific "trench trappery" is indeed a new development of modern warfare, and, like so many other things, it has taken the methodical and thorough Teuton to bring out its refinements, to make a fine art of it. Ever since the discovery of gunpowder the practice of mining a position about to be abandoned, the mine to be exploded when the advancing enemy came over it, has been resorted to, and that, indeed, was just about as far as it had gone—even in the present war—up to the time that it became apparent that the French and British pressure on the Somme was likely to go on indefinitely and increasingly. The wolf traps were only the first of a series of many devilish little devices left behind by the ousted Germans to deliver a last blow at the victorious "Tommy" or "Poilu," a sort of modernization of the famous Parthian shot.

Obviously, "trench trappery" par excellence is only practicable in the face

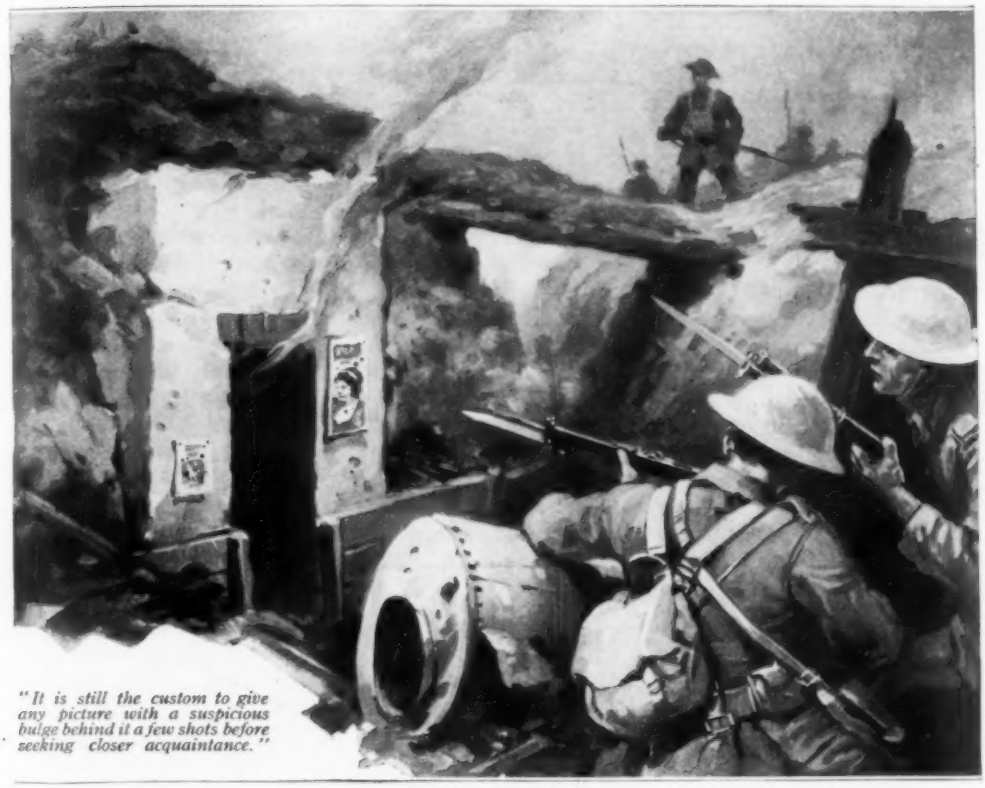


"The usefulness of the tortoise was over as soon as the wary Tommy ceased stroking its back with his bayonet and instead began hailing its appearance with hand grenades hurled from a respectful distance."

of a slowly and steadily advancing movement; just such a one as that on the Somme has become, or as Verdun was in its opening phases. Obviously, too—since the proverb that a once-burned child is twice shy applies with equal force to the French and British soldier—it must show a progressive development to stand any chance of success, must be constantly varied, constantly carried on in a new way. That the general scheme has been a flat failure is principally due to the fact that the Germans have not been able to vary their devices sufficiently to baffle their wary quarry, who, meeting guile with guile, have as often as not trapped the would-be trappers and "hoisted them with their own petards."

The wolf-trap scheme was evidently quite an ambitious one, for in addition to the considerable number of the big spike-jawed contrivances rounded up where they had been set, reserve supplies of them were among the spoils captured on several occasions. Probably not over a dozen French and British soldiers, at the outside, were stopped by stepping into these traps, while one is told of at least half that number of instances in which fleeing Germans, who might otherwise have made good their escape, were themselves caught and held in the very jaws they had spread for the enemy. The injury from these traps was usually confined to badly bruised and lacerated flesh, but in those cases where the jaws closed upon the ankle several of the small bones were usually broken or displaced.

Doubtless realizing that the results from the wolf traps were not commensurate with the trouble, the use of them has apparently been given up within the last few weeks, and the ingenuity of the Germans concentrated upon subtler but more deadly contrivances, mostly of the mine or grenade order. An abomination of creased steel, looking more like one of the famous ceremonial *kava* bowls of the Samoans than anything else I have ever seen, has evidently been manufactured in considerable quantities for no other purpose than to furnish unpleasant surprises to precipitate Tommies. The latter have nicknamed it the "tortoise," and until they learned that, like its slow-moving animal prototype, it was unsafe to take liberties with, several of them paid the penalty of their curiosity by being injured when it blew up as a consequence of their friendly prods of investigation. In that its very strangeness of appearance invites attention,



"It is still the custom to give any picture with a suspicious bulge behind it a few shots before seeking closer acquaintance."

the tortoise is like the famous Trojan horse, and the consequences of investigation are, likewise, disastrous. The least touch to the wobbly thing established a contact, doubtless through fulminate of mercury, on the same principle as employed in the floating mine, which detonated 20 or 30 pounds of explosive with a force that shattered the thick steel shell—creased as it was like the casing of a hand grenade—and scattered the fragments over a wide area. The menace of the tortoise was over as soon as Tommy learned to curb his curiosity. On my visit to a collecting depot I was allowed to "play" with one of them, from which the "teeth" had been drawn, and I must confess that the weird roly-poly thing might well exercise considerable fascination upon one encountering it for the first time. One feels that he simply *has* to go up and give it a shove with the toe of his boot, just to watch it wobble, the very action calculated to make it "put up back" and "fly to pieces."

The usefulness of the tortoise was over just as soon as the wary Tommy ceased stroking its back with his bayonet and instead began hailing its appearance with hand grenades hurled from a respectful distance, and the wily Teuton was forced to rack his brain to devise still deeper "subtlety." Something of the direction his latest effort has taken was revealed by a Tommy who was exhibiting to me some of the treasures he had gathered in cleaning up a recently occupied German dugout. One of these, carefully preserved between the leaves of a magazine, was the photograph of what was evidently a German girl, punctured with not less than a dozen bullet holes.

"Did you take it from a German soldier?" I asked.

"No, sir," was the reply; "only from the wall of a dugout."

"But how did she come to get so

shot to pieces?" I asked; adding banteringly, "I have never heard that the *British* soldier makes war on women."

"But this 'Un lydy was makin' war on us, sir," he answered with a grin; "or leastways one of 'er friends three or four dugouts down the line tried to *strafe* us, and we had orders to *strafe* back."

Then he went on to explain that the Tommies had always vied with each other in collecting photographs from the walls of the captured dugouts as souvenirs, a circumstance which the Germans, who appeared to have got wind of it in some way, endeavored to take advantage of by running a wire from the back of some of these mural decorations to mines concealed beneath the floor. The Tommies had already learned to avoid stepping on the loose ends of boards, and to refrain from rocking tortoises and picking up inconsequential odds and ends from the floor; but the "mined" photograph was something new, and before the ruse was discovered several "cleaning-up" parties were made to pay rather heavily for the desire of certain of their members to add another " 'Un frawline" to their picture galleries. Photo collecting languished for some little time after the "designing" nature of some of these abandoned Gretchens and Hildas had been disclosed, and it is still the custom to give any picture with a suspicious bulge behind it—if there is room to do it in safety—a few propitiatory shots before seeking closer acquaintance.

DRAINING SOUTHERN SWAMPS FOR FARMING PURPOSES

Reclamation work of noteworthy character is transforming large areas of southern Louisiana swamp land into rich tracts for intensive cultivation. Although the method employed is comparatively simple in plan, its execution involves much arduous labor. By digging a navigable canal around the four sides of a district to be drained, a levee is thrown up which protects the land from tidewater as well as that which is backed up by strong Gulf winds. At some central point along the dike system, piling is driven to support a concrete foundation for a pumping station. Extending from the site and bisecting the tract, which usually embraces from four to six sections of land, a broad reservoir canal

Dredge at Work Deepening One of the Big Irrigating Canals in Southern Louisiana Where the Reclamation of Swamp Lands is being Carried Out: The Building in the Background Is the Pumping Station for the District

is projected. Along it, at intervals of about a half mile, lateral slips, approximately 25 ft. in width, are excavated at right angles. Radiating from these, in turn, narrow sublateral ditches are dug, 200 or 300 ft. apart. Thus the whole area is reached, and during wet seasons, when from 10 to 12 in. of rain may fall in a month, the water is carried into the central reservoir canal from which it is pumped to some outlet. Although such a thing is rarely necessary, because protracted dry periods are extremely exceptional in southern Louisiana, the fields can be subirrigated by siphoning enough water to fill the sublateral, or field, ditches.

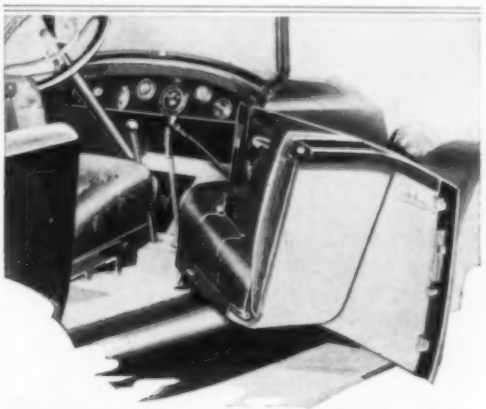
The cost of the reclamation averages about $40 an acre, while the annual maintenance charge ranges from 75 cents to a dollar. The canals serve a twofold purpose, for in addition to draining the land and rendering it fit for cultivation, they provide the transportation arteries used by the agriculturist in reaching his markets. The harvested products are conveyed to distributing points by barges. Climatic conditions permit the land to be utilized almost the year around, from three to four crops being raised annually.

DOUBLE-WALLED PAPER CUP KEEPS HOT DRINKS WARM

An inexpensive paraffined-paper cup has been invented in which coffee, or other liquids, can be kept warm for a long time and so is especially suited for selling hot beverages on trains or excursion boats. It is provided with a tightly fitting cover. Its heat-retaining property is derived from the fact that it is double-walled, with a dead-air space between the two walls which are kept apart by a layer of corrugated paper.

ROADSTER HAS ONE DOOR FOR BOTH SEATS

An important new feature of a moderate-priced roadster is a single door,



New Type of Roadster Door Which Gives Direct Access to Front and Rear Seats: With the Door Closed the Two Parts of the Front Seat Fit Tightly Together

29 in. wide, which gives direct access to both front and rear seats. This sort of entrance is made possible by attaching a 7-in. section of the front seat to the inner side of the door, the upholstery being so arranged that the two parts of the cushion fit together tightly when the door is closed. When it is open it leaves an entrance to the front seat, 7½ in. wide at its narrowest point. The passage to the rear seat is 10 in. wide. The stationary portion of the front seat is 34 in. wide, and so can hold two comfortably when the door is open. The latch is operated by either of two handles, one of which is accessible from the front and the other from the rear seat. A 17-in. door is provided for the driver.

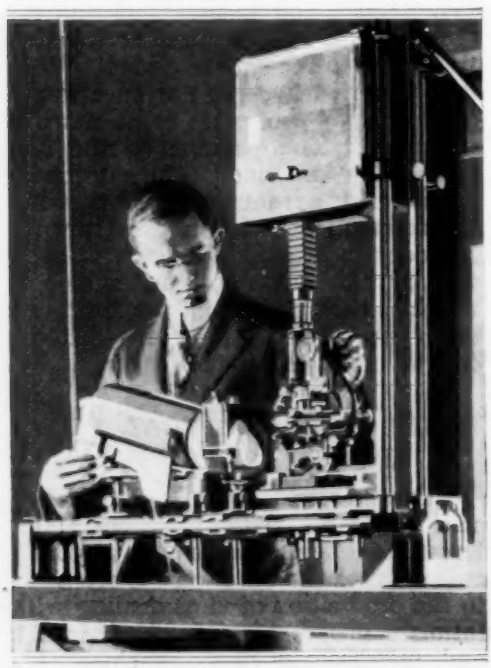
PRODUCE ZOOLOGICAL FILMS FOR UNIVERSITIES

Natural-color moving pictures of scientific value and much general interest are being made by a young zoölogist who is devoting his attention to the production of films dealing with intimate phases of plant, bird, insect, and microscopic life. Much of his apparatus is of his own development.

In addition to a studio, which consists of a laboratory, dark room, drying

Insects are the Actors in the Outdoor Movie Play being Filmed as Shown Here. The Mirror is Used for Lighting Purposes

room, and workshop, he has a conservatory, the entire roof of which is covered by shutters composed of movable sections so arranged that daylight may be excluded from the glass house. A single control system is employed which, upon being set in action, closes the shutters, turns on high-power lamps, exposes the movie film, extinguishes the lights, and finally opens the daylight shutters. Films made at the plant are chiefly of an educational character and intended for certain universities which use them in connection with class lectures. Nature-study films of purely popular interest are also to be turned out for movie-producing companies.



Making Films of Microscopic Life in the Laboratory with Specially Designed Equipment

OUR RED CROSS CAN LEARN MUCH FROM BRITISH

That the American Red Cross can learn as much from the British Red Cross as our army leaders are learning from European fighters, is the opinion of those who have a personal knowledge of the greatly enlarged tasks that now confront our society for the care of the needy and the suffering. England found, for example, that at the outset there was much extravagance and overlapping of effort, partly because of the overenthusiasm of workers. Today, under strict government control, the expenses of the British Red Cross are exactly nine cents in every five dollars.

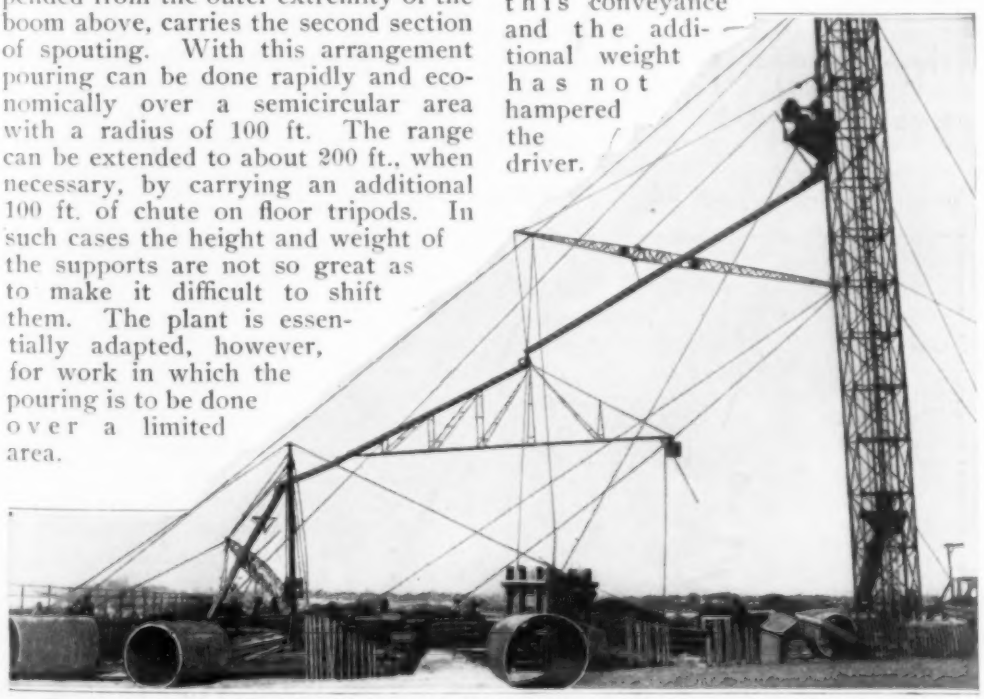
One of the great services which our society will soon be performing, according to Lord Northcliffe, who is a British Red Cross officer, is the search for the missing and wounded. "In a few months will come across the cables the sad and significant word 'missing'," he declares in a recent statement. "Anxious parents and relations will instantly start cabling that inquiries be made. The British Red Cross Society has opened a branch whose sole task it is to collect every possible item with regard to missing men. Some of the work is undertaken by priests and clergymen who go around the hospitals and board the hospital ships, asking questions of each of the missing men's comrades. All this information is col-

lected and filed systematically. . . . The society has over and over again discovered men reported missing."

The eagerness of Americans to serve in this cause must now be supplemented by an equal measure of efficiency.

TIME AND TROUBLE-SAVING CONCRETE-CHUTING SYSTEM

In erecting a warehouse for the harbor commission at Los Angeles, a gravity concrete conveyer, arranged to permit easy and quick shifts, has been employed. The disadvantages of supporting the spouting system by means of overhead cables, or by floor tripods, are overcome by a new plan of suspension. An open steel boom, hinged to the face of a hoist tower so that it can be revolved through an arc of about 180°, holds the first section of the chute. The trough is of the same length as the boom, and passes through the middle part of it. A counterweighted trussed frame, held by a cable suspended from the outer extremity of the boom above, carries the second section of spouting. With this arrangement pouring can be done rapidly and economically over a semicircular area with a radius of 100 ft. The range can be extended to about 200 ft., when necessary, by carrying an additional 100 ft. of chute on floor tripods. In such cases the height and weight of the supports are not so great as to make it difficult to shift them. The plant is essentially adapted, however, for work in which the pouring is to be done over a limited area.



Showing the Easily Shifted Gravity Concrete-Chuting System as Used in Erecting a Warehouse for the Harbor Commission of Los Angeles

MOTORCYCLE AND SIDECAR CARRY FAMILY OF FOUR

A very roomy sidecar of odd design has been attached to a motorcycle by its owner so that he can take his wife and two children with him on outings. The addition resembles two sidecars combined, with the two seats facing each other. The three extra passengers find it very comfortable riding in this conveyance and the additional weight has not hampered the driver.

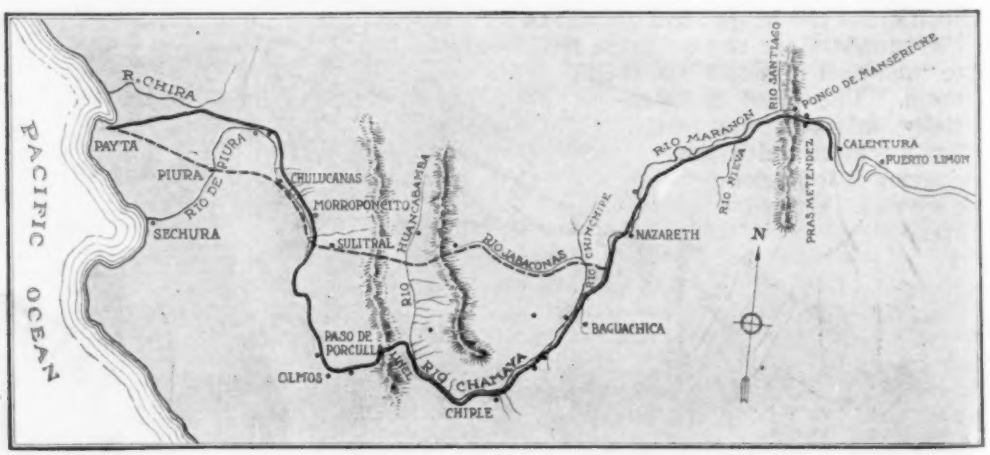
Motorcycle and Unusually Roomy Sidecar, with Which a Husband, Wife, and Two Children can Enjoy Outing

TRANS-ANDEAN LINE TO TAP PERUVIAN RESOURCES

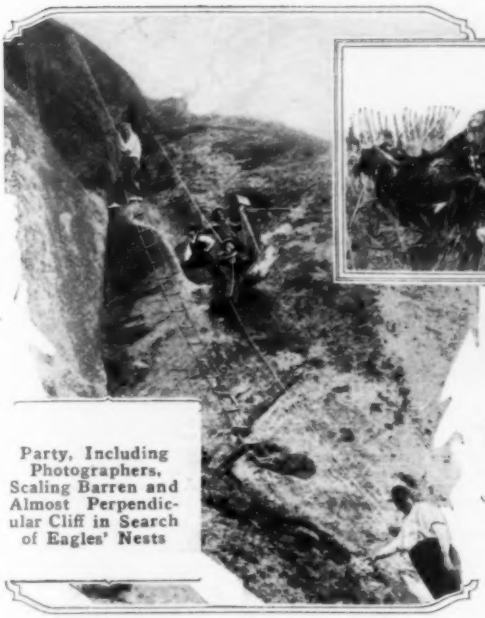
Engineering plans have been formulated and United States capital enlisted for the construction of a 400-mile railway across the Andes in Peru to connect the Pacific port of Payta with the Marañon River, as the Peruvian part of the Amazon is called, and which with it offers a direct water route through northern Brazil to and from the Atlantic seaboard. The road will open for development a region tremendously rich in mineral deposits, timber, and agricultural possibilities. It also will establish a transcontinental rail-and-water artery of importance and greatly benefit the rubber district of western Brazil by bringing it fully a month closer to North American ports. The railway will carry products from northern Brazil, eastern Peru, northern parts of Bolivia, the eastern section of Equador, and the southeastern part of Colombia to its western terminus at Payta, where coastwise steamers bound north through Panama Canal will receive cargoes. If the plans recently announced are being executed on schedule, actual operations should now be in progress. The construction will be of a difficult nature, for the Andes form a colossal barrier that is not easily surmounted. The pass where the line will cross the divide is 16,000 ft. above sea level and the lowest available point along the range. In going eastward to the pass, the grade will be high, and after leaving it, very precipitous. It is expected that the construction period will embrace about three years. In addition to its commercial importance, the line will be one of great scenic splendor and will therefore doubtless have the effect of attracting tourists and strengthening the acquaintance of North Americans with Latin-Americans of the region. The Peruvian government has interested itself in the enterprise to the extent of granting generous concessions in lands and privileges.

SEARCHERS FOR AERIES HAVE PERILOUS TASK

One of the thrilling and hazardous duties which sometimes falls to the lot of game experts and wardens in mountainous regions of the West is to search out eagles' nests, rob them of their eggs, and perhaps take the young captive. The perils of the task are not all passed when, with a rope ladder or by other precarious means, he has ascended or descended to the aerie, for then the intruder must face the powerful grown birds at close range and often when he cannot defend himself



Showing the Route of the Trans-Andean Railway in Peru, Which will Link the Port of Payta on the Pacific Coast with the Headwaters of the Amazon and Establish a Rail-and-Water Transportation System across the Northern Part of the Continent



Party, Including Photographers, Scaling Barren and Almost Perpendicular Cliff in Search of Eagles' Nests

Above: Two Eaglets, 60 Days Old, Quite Able to Manifest Their Displeasure toward Intruders

Right: Capturing Mother Bird While Hanging over a Precipice

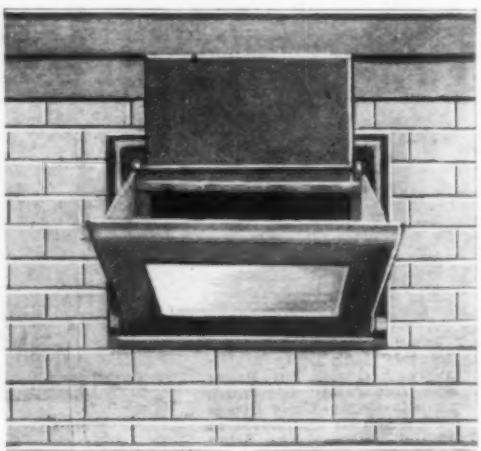
to advantage. The searcher for the lofty nests also finds that the young, 50 or 60 days old, can become disagreeably aggressive.

FORESTERS ARE RECRUITED FOR SPECIAL REGIMENT

Acting upon a suggestion made by the British war mission during the series of conferences at Washington, the War Department has ordered that a forestry regiment be organized as one unit of the engineer corps that is soon to be sent to France. It will be the duty of this force to convert available timber into suitable material for use in bridge, railroad, and trench construction. Technical experts, in coöperation with French foresters, will superintend all cutting in order to avoid needless waste and to prevent, so far as possible, permanent damage to timber lands. The body will be officered by trained foresters and expert lumbermen, but will be recruited only partly from the government forest service. To accompany the unit to the front a special regimental flag has been designed. It consists of a deep-blue field on which a white pine-tree shield is encircled by 13 stars.

METAL-WINDOW COAL CHUTE PROTECTION TO BUILDING

To prevent the adjacent wall from being needlessly marred and blackened when coal is discharged into the basement of a building, a cast-iron and steel chute window has been introduced. The front of it is fitted with a pane of reinforced glass so that it normally serves as a burglar-proof cellar window. When the device is opened, a metal shield, that protects the wall surface above the aperture, is automatically raised into position. Similarly the top segment of the chute slides forward and covers the glass.

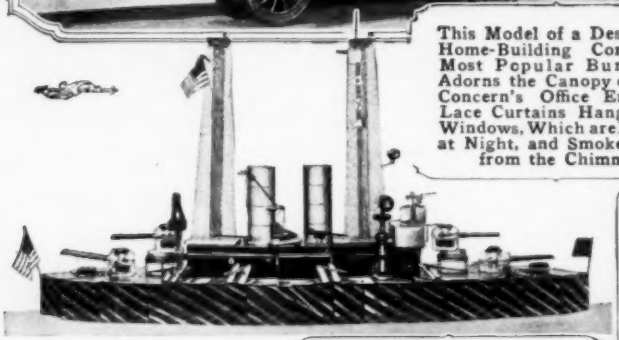


The Feature of This Coal Chute and Burglar-Proof Window Is the Automatically Opening Lid That Protects the Wall above It

EFFECTIVE IDEAS USED IN VARIOUS CITIES

This Model of a Des Moines Home-Building Company's Most Popular Bungalow Adorns the Canopy over the Concern's Office Entrance. Lace Curtains Hang in the Windows, Which are Lighted at Night, and Smoke Issues from the Chimney

New Headgear for a Sandwich Man: Inside This High Hat with Its Transparent Sides Is a Woman's Shoe That Effectively Advertises a New York Store

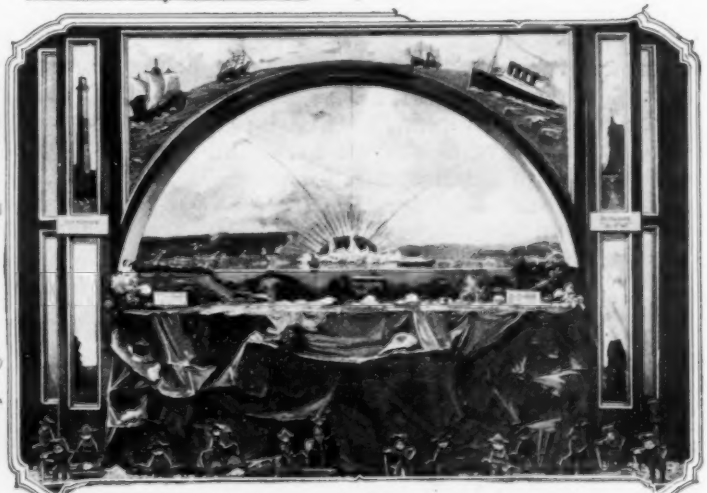


Not a Real Battleship, of Course, but a Clever Combination of Office Supplies in a St. Joseph, Missouri, Window. The Hull Is of Metal Book Ends; Guns Are Penholders; Rolls of Adding-Machine Paper Compose the Smokestacks. Wire Forms, Covered with Clips, Make the Masts

This Coat Rack is so Made That When a Garment is Hung on the Hook a Card Bearing an Advertisement is Turned Up in Full View of Passers-By

COPYRIGHTED BY THE DANDYLINE COMPANY

Paper Dolls as Business-Getters: Each Dress Which is Provided with This Paper Doll Accurately Illustrates a Girl's Ready-Made Dress, Which can be Purchased in Various Sizes. The Store Selling the Dresses Carries an Ad on the Back of the Doll

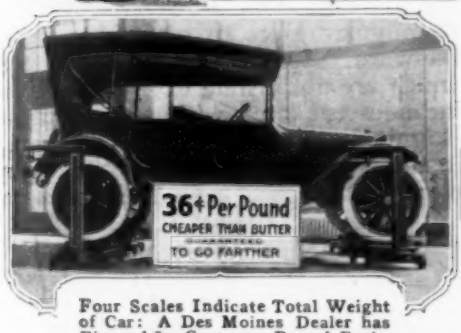


Mechanical Display in a Baltimore Window, Showing a Merchant Submarine's Operations: The Craft Travels between Shores Representing Europe and America, Submerging at Intervals and with Periscope Operating. In the Background Is an Iceberg Representing the Northland

IN COMMERCIAL AND PATRIOTIC ADVERTISING

A Telling Appeal for Recruits: A Mirror Which Takes the Place of the Face in This El Paso, Texas, Poster, Reflects the Face of Every Passing Reader

An Electrical Display That Shrouded the Top of a Portland, Oregon, Building in Misty Light: Roof was Lined with Colored Bulbs and Perforated Pipe, from Which Steam Issued. A Wheel Similarly Equipped Revolved Like a Pin Wheel



Four Scales Indicate Total Weight of Car: A Des Moines Dealer has Figured Its Cost on a Pound Basis, as Shown in His Clever Placard

Living "Dolls" Attract Much Attention: A New York City Store, Desiring to Advertise Its Stock of Dolls, Dressed Living Models in Costumes That Duplicated the Dolls' Clothes. The Playthings and Their Human Duplicates were Displayed Together

Patriotic Billboard Display, Overlooking Grant Park, Chicago, Which is Striking Because of Its Composition, Coloring, and Great Size, the Dimensions Being 50 by 133 Feet: The Figures of the Sailors Are About 30 Feet High. Columbia is Represented as Comforting a Weeping Woman, While a Stricken Child Lies at Her Feet

Bank in Which to Save Dimes for a Camera: Amount Needed for Various Cameras is Indicated on the Side. The Storekeeper Alone Knows the Combination

NIAGARA FALLS LIGHTING SYSTEM MADE PERMANENT

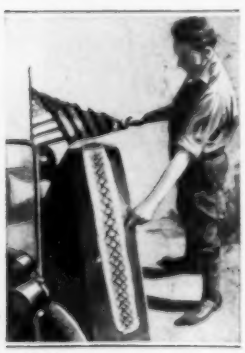
The electric-lighting system by which Niagara Falls is beautifully illuminated at night, and which was

One of the Permanent Shelters Which have been Built to House the Powerful Lights That Illuminate Niagara Falls at Night

described in Popular Mechanics Magazine a year ago, has been made permanent by local municipal authorities. The powerful lamps are now arranged at various advantageous points in cavelike shelters of rough stone and cement, which are partly concealed by shrubbery. Across the front of these housings extends wire netting to keep out intruders.

AUTO CARRIES ODD TROPHY OF DESERT ENCOUNTER

A motorist living in the Southwest carries the skin of a 5½-ft. rattlesnake stretched on one car fender, as a souvenir of an unusual encounter. While driving slowly along a desert road, the rattlesnake attacked the car and, as the machine was being brought to a stop, the reptile tried to get into the pan under the engine. Finding this too hot he crawled to the rear, twining himself about the running gear. With the aid of a long stick the intruder was forced up on top of a battery under the car floor. The floor boards were then removed and the snake was driven out onto the fender where it was killed with a club. Later the skin was stretched on the fender to dry, and has been left there since.



ELECTRIC WARNING SIGNAL DESIGNED FOR MOTOR CARS

For automobiles, an electric warning signal that is virtually automatic in operation has been designed to minimize road accidents. The device, a lamp with a cylindrical reflector, is independent of the conventional tail light, although it is mounted on the same bracket and carries beneath it a license plate. The front is covered with a rectangular piece of glass that bears the word "SLOW" in large red letters, which are not visible except when the incandescent lamp within the housing is ignited. A push button incorporated in the clutch pedal controls the signal circuit. Thus, whenever the foot member is operated, the warning lamp is illumined and following motorists signaled. Use of the device requires no thought on the motorist's part unless he expects to make a turn without disengaging the clutch. It eliminates, in most cases, the necessity of signaling with the arm, a practice that is often almost useless at night and quite impossible when closed cars are driven. A pilot bulb installed on the cowl always indicates whether or not the signal is responding properly.

¶ Post-office officials ask that wherever there is an option between the use of one or more large-denomination stamps and several small-denomination stamps, on mail, preference should always be given to the former.

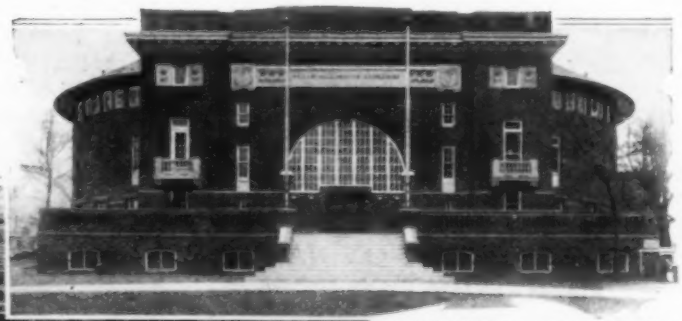
Hybrid Conveyance Employed in the Northwest, Consisting of a Long Bobsled Driven by an Automobile Stripped of Its Body and Front Wheels

NOVEL COMBINATION OF BOBSLED AND AUTO

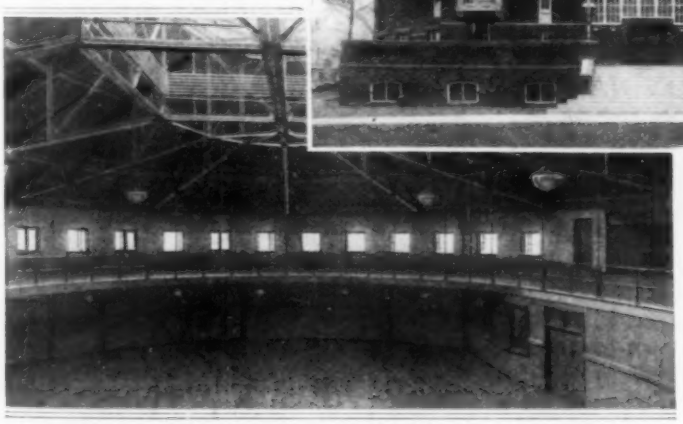
Many persons derived much pleasure and the owner considerable profit from the hybrid conveyance shown in the accompanying photograph, taken in the Northwest. It consists of a low-priced automobile stripped of its chassis and deprived of its front wheels. The forward end rests on the rear end of a long bobsled built for coasting. The rear wheels were provided with chains so that the car and sled made excellent speed in the snow, much to the delight of the closely packed passengers. The sled was guided with a circular steering wheel.

GYMNASIUM BUILDING OF ELLIPTICAL FORM

A gymnasium building recently erected on the campus of the Stevens Institute of Technology, Hoboken, N. J., at a cost of $125,000, the gift of a resident of New York, is of elliptical shape and believed to stand alone in this respect. The elliptical ground plan was adopted partly because of the irregular shape of the building lot and also to provide a running track of unusual attractiveness, due to the conformity of the walls with the shape of the track. Some experts



A $125,000 Gymnasium Having an Elliptical Ground Plan

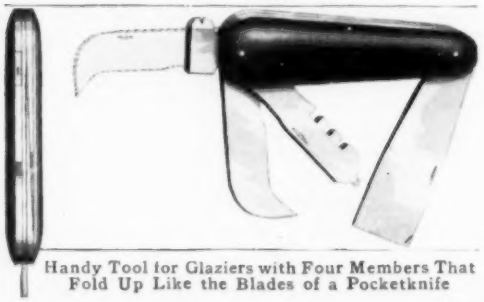


Interior View of Gymnasium Showing Part of Elliptical Running Track, to the Shape of Which the Outside Walls Conform Quite Closely

claim that the popularity and use of a track depend upon the psychological effect of its appearance, and this was borne in mind in planning the gymnasium. It is a two-story building of red brick, with limestone and terra-cotta trim, and a green-shingle tile roof. The first floor contains locker rooms, washrooms, offices, and a large practice room, 110 by 50 ft., 12 ft. high. A swimming pool, 60 ft. long, is provided at the south front of the building. The second floor contains the main gymnasium and oval running track with gallery space.

FIVE GLAZIER'S TOOLS COMBINED IN ONE

In an article possessing four folding parts have been combined several



Handy Tool for Glaziers with Four Members That Fold Up Like the Blades of a Pocketknife

glazier's tools, namely a glass cutter, a putty knife, a putty gouge, a glazier's hammer, and a tack puller. When the members are folded up, the combination tool has the size and appearance of a pocketknife.

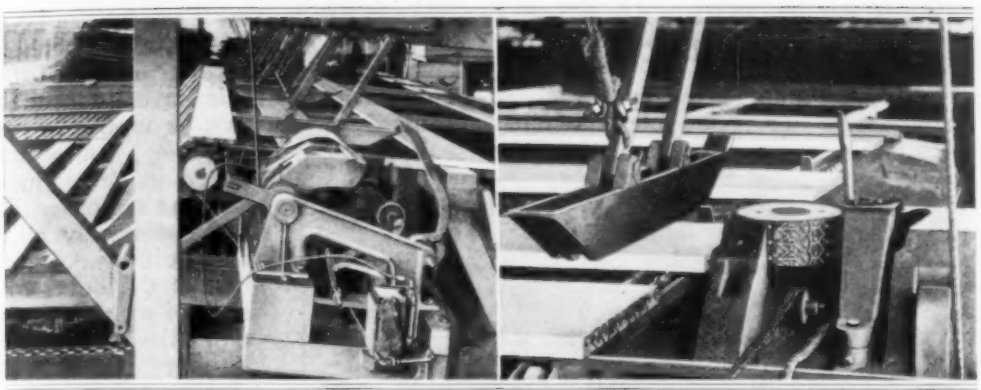
FINGER PRINTS ON NAVY'S IDENTIFICATION TAGS

The Navy Department has recently adopted what is believed to be the best system of identification known, being superior to that used in the European armies and navies. Each enlisted officer and man in the navy is to be provided with an oval identification tag of an alloy, known as monel, and measuring 1¼ in. wide by 1½ in. long. It is hung about the neck on a wire incased in a cotton sleeve. On one side of the tag will be etched the finger print of the right index finger and on the other side the owner's initials and surname, the date of his birth and of his enlistment, and the letters "U. S. N." The rank of officers will also be stated. A copy of these data, including the finger print made on paper, will be filed in the navy's identification bureau. The finger print is first made on the tag in ink, and the other data are written on the metal. The tag is then sprinkled with powdered asphaltum which is melted into the ink over an alcohol flame. Next, the tag is placed in a nitric-acid bath which etches the print and data on the metal. Monel is the alloy of which battleship propellers are made. It will resist a high temperature, will not corrode, and is not affected by salt water.

UKULELE-BANJO NEW CRAZE WITH STREET-SONG LOVERS

In one particular district where the ukulele gained remarkable popularity a year or two ago, a new instrument that is an adaptation of the Hawaiian device and the banjo is receiving considerable favor among the devotees of sentimental and ragtime music. Its tone is soft and nonmetallic and has even been compared by enthusiasts with that of the cello. It is of about the size of a ukulele, is played in the same way, and, because of its tambourinelike body, has somewhat the appearance of the banjo.

The New Soft-Toned Musical Instrument, the Ukulele-Banjo, is Shown Here in Front and Back Views



Conveyors Carrying Planks Past the Brander: It will be Noted That the Ends of the Planks to the Left of the Device are Branded and Those to the Right are Not. Right, Close View of Branding Drum Showing the Embossed Marks in Detail: The Shoe Helps Hold the Piece of Lumber Steady While the Drum Presses Against It

MACHINE IMPRINTS BRAND ON ENDS OF TIMBERS

For the same reason that the manufacturers of shoes, canned goods, thread, and thousands of other articles, have found it profitable to mark their products in some distinctive way, so producers of cypress lumber are branding each piece they turn out. A common symbol is used to indicate that the wood is cypress, and other marks designate the mill from which it comes. Each piece of lumber, before being sent to the yard to be piled, is carried by endless conveyors past a revolving metal drum, the entire face of which is embossed with the proper brands. One end of each plank, board, etc., passes this drum and receives the imprint one or more times. A shoe beneath which it is drawn helps to hold the lumber in place while the impression is being made. From the brander the lumber is carried down an incline to the stacking yard.

¶For the purpose of readjusting its facilities to meet the war emergency, the Pennsylvania Railroad Company has discontinued a total of 102 passenger trains, thus cutting down the passenger movement by an equivalent of 6,500 train-miles every week day. In addition, many parlor cars, restaurant cars, sleepers, etc., have been taken off.

PHONOGRAPH RECORDS PEAL OF LIBERTY BELL

The completion of the nation-wide campaign for funds for the Liberty Loan was most fittingly observed by the ringing of the historic Liberty Bell that hangs in Independence Hall, Philadelphia. In order that its tones be preserved for the future and repeated for the benefit of many now living who have never heard the bell, a phonographic record was made of the sounds. For this purpose an instrument was set up close by the bell. When all was in readiness the mayor of Philadelphia stepped up to the casting and solemnly struck it 13 times. The completion of the last stroke was the signal for whistles and church bells all over the city to join in announcing that the new campaign in the cause of liberty had been won.

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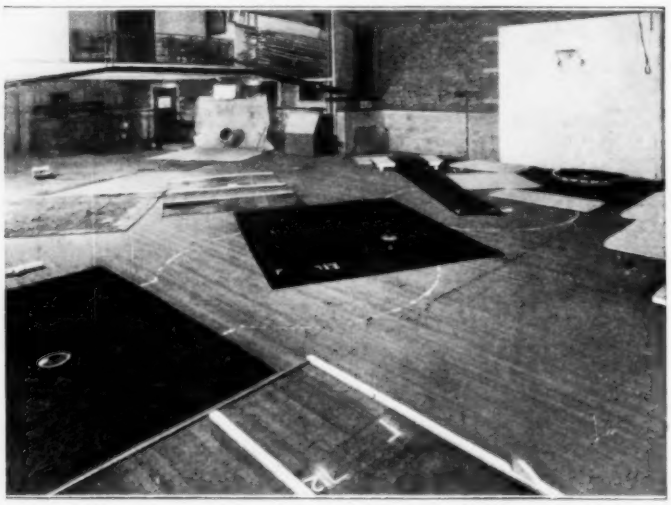
Liberty Bell and the Phonographic Instrument Which Made a Record of Its Tones When It was Struck to Mark the Completion of the Liberty-Loan Campaign

BRICKS, STOVEPIPES, RUGS, HELP MAKE INDOOR LINKS

With the aid of stovepipe, bricks, a barrel, rugs, etc., an 18-hole golf course was laid out in the rooms of the Telephone Club of New York for the benefit of 91 employes of the telephone company who were deprived of the enjoyment of their favorite outdoor sport during the winter months. One half of this most ingenious course was located in the gymnasium and the other half in the assembly room and adjoining quarters. Most of the holes consisted of disklike metal castings with a pocket in the center of each. These disks were placed on rugs scattered about the floor or laid over platforms or tables. In teeing off, in playing the first hole, the player was required to drive through a stovepipe elbow. Two holes were partly surrounded with bricks, and one rug was placed on an incline. Two-by-fours, concealed be-



View in the Club's Gymnasium Showing Several Holes, Including the Fourteenth, at the Right, Partly Surrounded by Bricks, and the Eighteenth, Which Is the Barrel near the Farther Wall

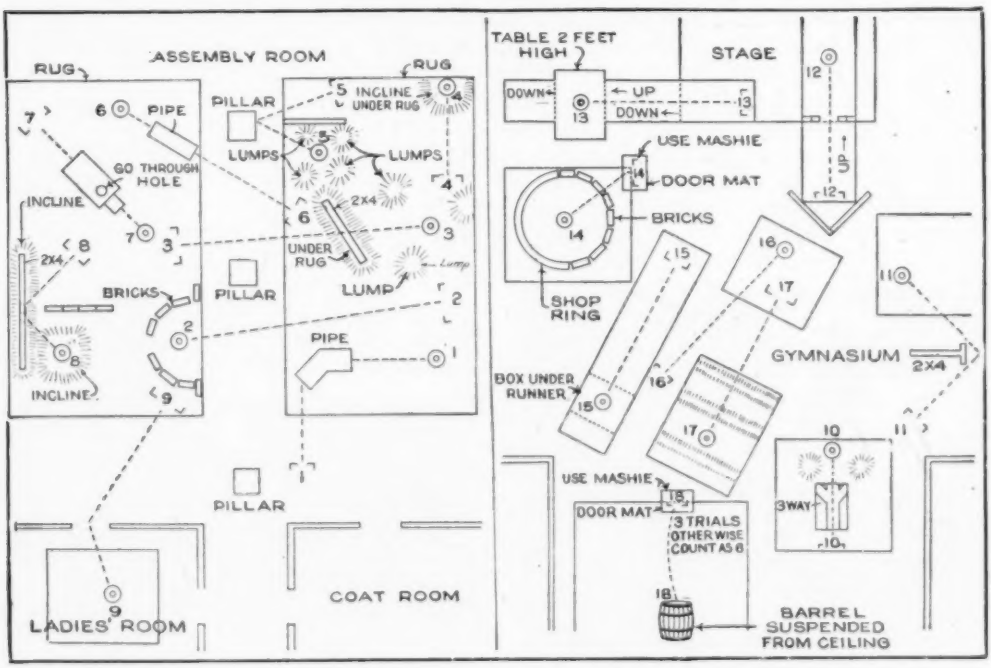


Diagram Showing 18-Hole Golf Course Laid Out in Rooms of a New York Club: A Barrel, Timbers, Tables, Bricks, and the Like, are All Utilized with Amusing Ingenuity

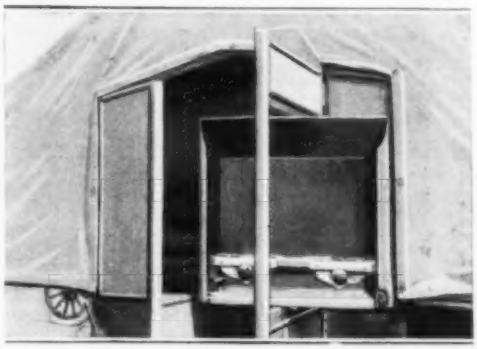
neath the rugs, created hazards. The eighteenth hole was a barrel tilted to one side.

MANY FIRES IN FORESTS CAUSED BY LIGHTNING

An interesting study of forest fires occurring during an eight-year period in the 18 national forests of California, reveals the fact that lightning is the principal cause of these conflagrations, 31 per cent, or over 2,400 fires, being attributable to it. These forests cover nearly 20,000,000 acres, and it has been estimated that the average number of trees struck by lightning is 15,000 per year. If such is the case, only about two per cent of these trees take fire. Extensive observation shows that trees of one species are as apt to be struck as those of another, but a tree's height with relation to surrounding ones, and the degree of its isolation, are important factors in attracting an electrical discharge. It is a well-known fact that lightning is particularly apt to strike in certain regions, the cause being either the condition of the soil or some underlying mineral deposit. While all species of trees seem to be equally liable to be struck, it has been found that certain kinds take fire much more easily than others. It is pointed out that the only way in which the fire hazard due to lightning can be lessened is to provide additional systematic means of discovering and extinguishing the conflagrations as soon as they are started.

SHIELDED STOVE IN DOOR OF CAMPING CAR

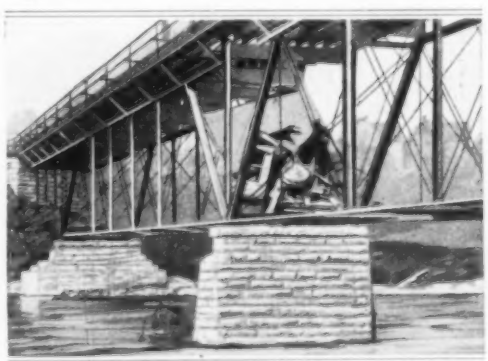
A new convenience for campers is a two-burner gasoline stove mounted in an opening in the rear door of a canvas-covered camping car. The stove swings on pivots situated above and below it, enabling the campers to turn the burners around so that they face the interior or the outside. In either case the sheet-iron protection, which forms the back of the stove and is the same size as the opening, serves as a windshield. When the stove faces inward the opening is entirely closed, so that the car can be heated.



Convenient Cooking Stove Mounted in the Door of a Camping Car: It can be Made to Face Either Inward or Outward. In the Former Position It Completely Closes the Opening

TRUCK AND DRIVER FALL THROUGH HIGH BRIDGE

While a truck, laden with seven tons of crushed stone, was crossing a high bridge in a middle-western city the structure gave way, letting the big vehicle drop down 30 ft. By a rare chance the dislodged bridge flooring caught between part of the supporting framework and the pier in such a way as to prevent the truck from falling into the water. What was more remarkable, the driver, who clung to the steering wheel during the fall, was not seriously injured and the truck not badly damaged.



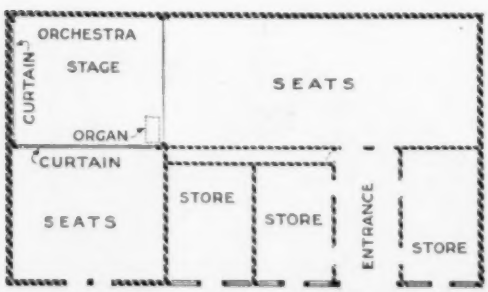
Bridge After It Gave Way under Heavily Laden Truck: The View Shows the Strange Manner in Which the Timbers and Pier Caught the Vehicle and Prevented It from Falling into the Water

SICK ELEPHANT INHALES VINEGAR FUMES

A remedy for colds, quite suggestive of the old-fashioned home methods of treatment, is used by the trainer of a certain motion-picture zoo to cure the colds of the elephants in his charge. He places a bucket of boiling-hot vinegar in a bag and then ties the latter snugly about the indisposed animal's trunk so that he is compelled to inhale the beneficial fumes whether he wishes to or not.

ONE STAGE AND ORCHESTRA SERVE TWO THEATERS

By an unusual arrangement of two theaters, facing intersecting streets and set at right angles to each other, one stage and one orchestra serve two audiences. The screen for the first theater is situated at what is the back of the stage for those in that auditorium, while the orchestra and organ are located in front of the screen, outside the projecting machine's field. Pictures for the spectators in the second theater are thrown on a screen which hangs at right angles to the other one, hiding the orchestra and organ from the view of the second audience. However, the music can be heard distinctly through the curtain, and occasionally one audience can hear the applause of the other, but that is not frequent enough to be annoying.



Two Theaters That Use Same Stage: Upper Half of Above Plan Shows One Theater with Curtain at the Extreme Left. In Lower Left-Hand Corner Is the Smaller Theater with Curtain at Side of Same Stage

MARKERS PLACED AT STATE LINES ALONG HIGHWAY

For the benefit of overland motorists, sightly, legible signs are being erected along the Lincoln Highway to mark the various state-boundary lines that are traversed. The devices are 22 by 34 in. in size and mounted 7½ ft. above the road on stanch posts. The lettering appears in white on a black groundwork and indicates the names of the abutting states, as well as the general directions of New York and San Francisco.

USE GAS IN STEAM ENGINE IN PLACE OF STEAM

While a company was sinking a well for oil in a rich oil field not long ago the drill struck a flow of natural gas having very high pressure. Since it was oil and not gas that the company sought, the driller determined to utilize the gas as a substitute for steam in the steam engine that furnished power for the drilling rig. After making the proper connections the gas was turned into the boiler, but the pressure was so high that it broke the gauge glass and blew out the safety valve. After replacing these broken parts with steel pipes the gas was again turned on, and it was found that the engine operated very satisfactorily with this novel substitute for steam.

SCHOOL BUILDS HOSPITAL FOR MILITARY USE

View of Columbia University's War Hospital: On the Left Is a Finished Ward and on the Right Is One Partly Completed. This Institution will Become an Integral Part of the School's Medical Department Where Students will be Able to Take Thorough Training in Military Surgery. About $250,000 Is the Cost of the Hospital, Which Will Have 500 Beds

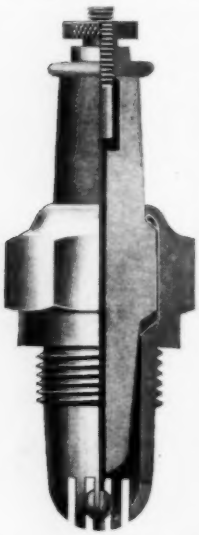
One of the Completed Wards, Each of Which will Contain 25 Beds: The Plant will be Run as a Base Hospital, and When Occasion Arises the Entire Institution can be Employed in Caring for Our Sick and Wounded Fighters. It is so Situated That Other Units can be Added as Needed

A Corner in One of the Wards—an American Scene Which Helps Make the Near Approach of Actual Conflict Very Real to Persons in the East: Among Those Invited to Inspect the Hospital Was a Representative of the British Medical Corps Who Well Understands War Needs from a Medical Point of View

Equipped to Prepare the Best of Foods for Wounded Soldiers: This View of the Hospital Kitchen Shows a Dish-Washing and Sterilizing Machine at the Left, While Beyond, Ranges with Ventilating Flues can be Seen. Every Effort has been Made to Construct and Equip This Part of the Hospital in the Most Scientific Manner

SELF-CLEANING SPARK PLUG ESCAPES CARBON NUISANCE

One of the advantages claimed for a spark plug of new design is that it acts as an energizer or intensifier, and ignites exceedingly thin mixtures. The lower extremity of the device is a slotted cage, inclosing a small ball that is continually in motion when the engine is running. The effect of this is to keep the surfaces free from carbon deposit and produce double sparking. The spark leaps from the central electrode to the ball, and from it—since it is constantly jumping about — to the cage wall or grating.



IRRIGATION DITCH USED AS A BICYCLE PATH

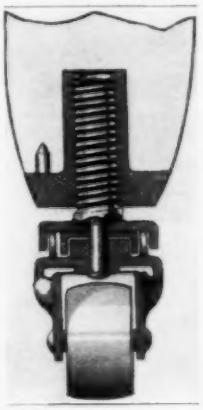
An empty irrigation ditch near South Pasadena, Calif., serves as a short cut for several boys who ride their bicycles to and from school. This unusual route saves some of them as much as 15 minutes a trip, and if it were not followed, it would be necessary to traverse a road which is not only circuitous but also hilly. The ditch is several feet deep, is walled in with concrete, and has a floor of cobblestones which are so covered with deposit that they make a satisfactory roadway for bicycles. Water flows through this artificial course only about two months in the year.

ADVOCATE SHIPPING BOXES OF STANDARD SIZES

The manufacturers of women's hats have recently indorsed the proposal to effect an economy by standardizing the sizes of packing boxes. They have found that a great deal of unnecessary expense is entailed because of the many irregular sizes used. It is estimated that the packing cost of trimmed-hat manufacturers is two per cent, and that this item could be cut one-fourth by making the shipping receptacles of standard dimensions.

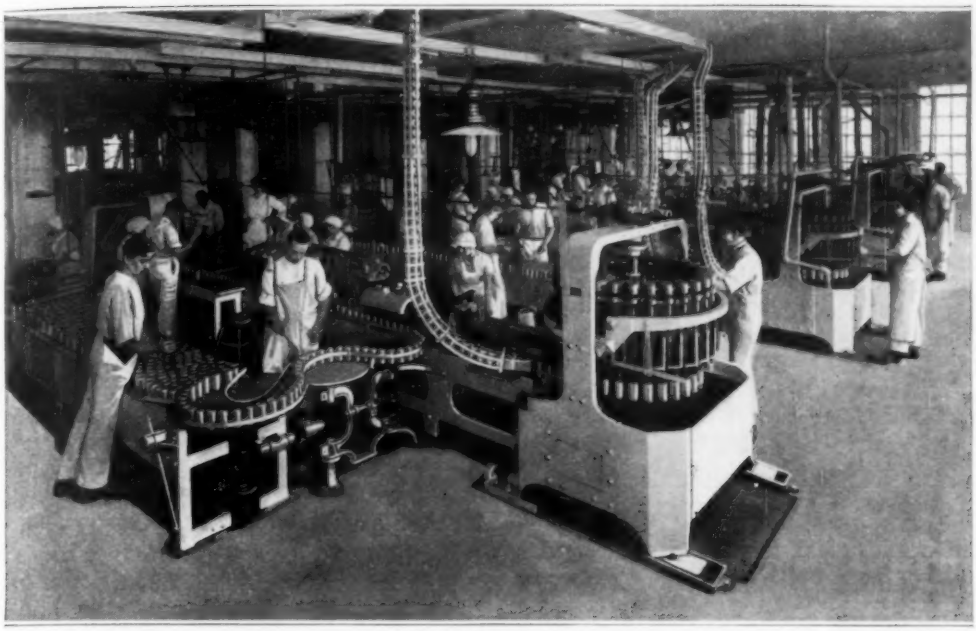
CASTERS CAN BE ADJUSTED TO AN UNEVEN FLOOR

By using patented adjustable casters, a table, desk, or other article of furniture, can be made to stand securely though its legs are of slightly different lengths or though the floor is uneven. The barrel of this caster, which is inserted in the end of the leg, is threaded on the inside to receive a threaded sleeve. The stem of the roller is inserted into this sleeve and turns about freely in it. By screwing the sleeve in or out the caster can be lengthened or shortened as the conditions may demand. Roller bearings are provided which promote easy operation of the article.



CAPACITY OF CAN-FILLING MACHINE IS GREAT

In a large factory that produces enormous quantities of soups, baked beans, and similar prepared foods, a battery of highly efficient can-filling and capping machines is operated. An endless stream of cans is fed to a cylindrical filling apparatus at one end of a connected pair of worktables.



Each of the Machines in This Battery Fills 9,600 Cans an Hour When Operating without Interruption

From there the receptacles are carried by a conveyor belt around the edges of the benches to various workers who do the actual sealing and soldering. The striking point is not the system, but the capacity of the machines. Each of them fills and delivers to the workers 160 cans a minute, which means that in 10 hours of continuous operation it handles 96,000 cans.

SEVEN-PASSENGER DONKEY MAKES OVERLAND TRIP

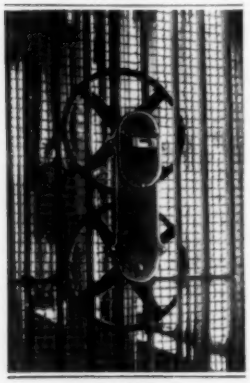
One lone, well-fed mule is slowly pushing, carrying, and pulling a family of seven persons across the continent. Not long ago it reached Cincinnati on its way from New York to San Diego. Each day it trudges along a few more miles, and each night it grazes by the

Getting Away with a Steam Locomotive's Job: A Lone Mule That is Transporting a Family of Seven Persons across the United States

roadside while the travelers sleep near by in a tent. When on the road, a U-shaped piece of pipe connects the collar about the mule's neck with the back of a tricycle. This is ridden by the crippled head of the transient family. He steers the procession. On its back the mule has a saddle that accommodates a small youngster. At the rear is a large covered cart that carries the rest of the members, one or two of whom take turns walking in order to lighten the load. The family is bound for its home, not making the trip on a bet. It pays its expenses by selling postal cards en route.

ELEVATOR MILEAGE BASIS FOR POWER CHARGE

Electric elevators in Los Angeles buildings are being operated on a mileage basis. Power companies receive a specified amount for each mile that a car travels during a month, in place of being paid a flat rate for the current consumed. Because of this, a special meter is used which registers miles instead of kilowatt-hours. Local power-rate regulations are understood to have influenced the adoption of this system.

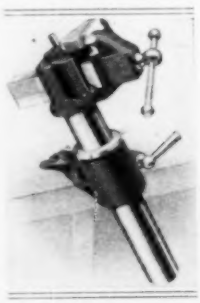


ROAD BUILT ACROSS MARSH BY DREDGING CANAL

Before long a motor highway will be completed which will provide New Orleans a direct route to towns in western Mississippi. The project is one of the most interesting engineering feats of its kind that has been undertaken in southern Louisiana. Much of the district traversed is a salt marsh, which at high tide is practically covered with water. Because of this and other local conditions that have had to be surmounted, the finished road will stand as a memorial to the enterprise and persistence of its builders. The particularly important section of the artery extends between Chef Menteur and the Rigolets, both of which are channels that connect lakes Pontchartrain and Borgne. To establish a road across the marsh, a 30-ft. canal has been excavated for a distance of about 10 miles, and the material thus obtained used in constructing an embankment along one side of it. This will give the highway, which will have an eight or ten-foot elevation, a 100-ft. base. The crown will be approximately 30 feet wide. The road will connect with an 18-mile artery that reaches from New Orleans to Chef Menteur. This is being surfaced and put in good condition. Steps are also being taken to project at once the road from the Rigolets to Slidell, La., whence it will continue into Mississippi. This third section will necessitate the erection of about seven and a half miles of embankment similar to that just described. For the present the expense of building bridges across the two canals will be avoided by establishing ferry service.

NEW BENCH VISE CAPABLE OF MANY ADJUSTMENTS

The feature of a new adjustable vise is the stem that it is mounted on by means of which the tool can be raised or lowered, turned with the vise handle toward or away from the bench, and tilted to the right or left. A single turn of a lever locks the tool in the desired position. The advantage of this vise is that it enables the laborer to work in the most comfortable posture and to have his material in the best possible light.



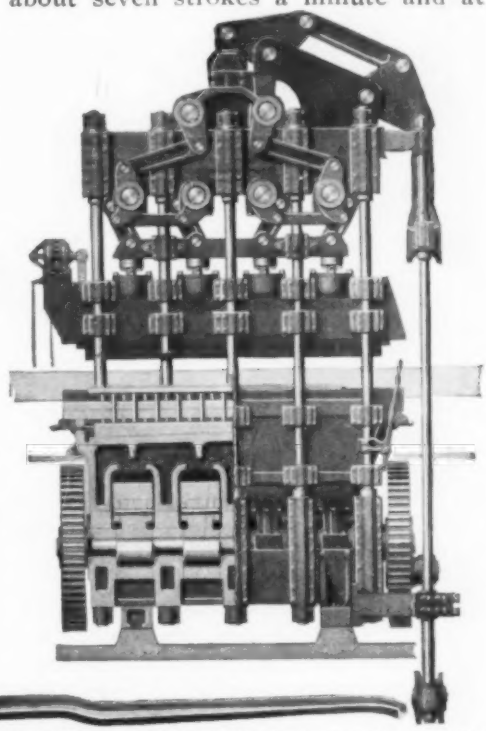
High-School Pupils at Pueblo, Colorado, Using Chemical Fire Extinguishers to Quench Bonfire: This is Done Once Every Year to Ascertain That This Part of the School's Fire-Protection Equipment Is Dependable

EACH YEAR PUPILS EMPTY FIRE EXTINGUISHERS

It is not enough that fire extinguishers hang on the walls of the Centennial High School, Pueblo, Colo. The authorities are determined that they shall at all times contain chemicals that are absolutely dependable, and so the tanks are emptied once a year and refilled with new materials. The emptying and replenishing is done by the students, under proper supervision, and is the occasion of quite a demonstration, as shown here. A huge bonfire is built, and while hundreds are gathered about, the year-old chemicals are turned on the blaze.

BIG RAIL-FORMING PRESS HAS HIGH EFFICIENCY

For forming channel-section rails of great accuracy and absolute uniformity, such as are used for motor-car frames, a powerful press that operates on the toggle principle and prevents warping and buckling, has been developed. The machine is driven by a 125-hp. motor, exerts a pressure of about 2,000 tons, and is able to handle blanks of steel 17 ft. long and 3/8 in. thick. It measures 15 ft. from front to back, is nearly 21 ft. long, 31 ft. high, and weighs 325 tons. The press makes about seven strokes a minute and at



Huge Press That Operates on Toggle Principle and Forms Channel-Section Rails, Such as is Shown at the Bottom, without Buckling the Webs or Twisting the Sides

each of these two complete opposing rails are formed. In the process of production the apparatus employs two motions. One slide moves down and clamps the blank of metal, holding it perfectly flat as the succeeding movement of the machine forms the sides of the channel, or frame. Following this the finished member rests free from obstruction on top of the die ready to be removed. Neither do the webs buckle nor the sides become twisted when parts are formed in this manner. Therefore it is claimed that the machine eliminates 90 per cent of the labor usually involved in such work, overcoming as it does the need of employing expensive manual methods of straightening the parts after they leave the press.

OLD UNICYCLE RIDDEN IN RECENT PARADE

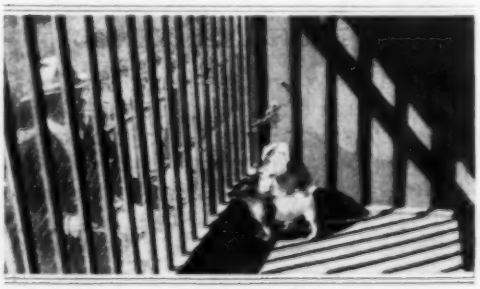
An entry which attracted special notice in a parade held recently was a

Unicycle Built 35 Years Ago and, after a Generation of Disuse, Ridden in a Recent Parade: The Rider Paddles with His Feet and can Make Good Time on a Level Road

unicycle built over 35 years ago. After having been stored away for a generation, the strange device, said to be the first of its kind ever built, was brought out and ridden through the streets once more. It consists of a huge metal hoop with a saddle mounted on an axle which is suspended at the center by four sets of wires. The rider sits on this saddle and with his hands grasps the ends of two movable lateral braces that can be rested on the ground to support the cycle when it is not in motion. This wheel bears some resemblance to a unicycle described in Popular Mechanics Magazine for April 1914, but the latter vehicle was driven by an air propeller, whereas this one is driven by paddling with the feet.

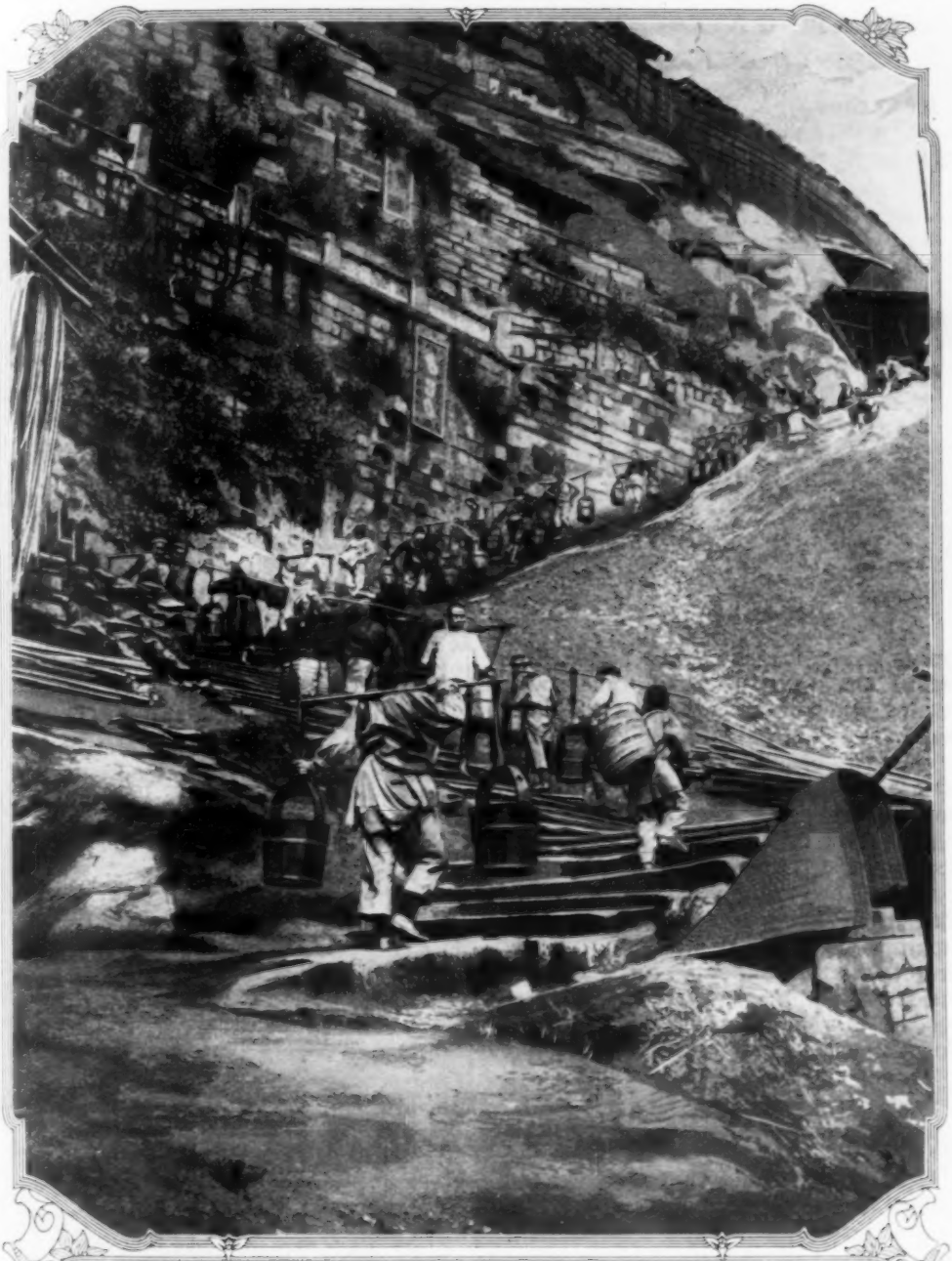
LION CUB AND PUPPY LIVE HAPPILY IN SAME CAGE

A lion cub and a Scotch-terrier puppy, both of which belong to a private zoo, live in the same cage and are fast friends. In quite a literal sense theirs is a life-long friendship for they were born only a day apart, early last April, and as soon as the cub opened his eyes, at the age of a week and a half, the two were put in the same inclosure. Each seams to imagine the other is his brother. The two drink from the same pan and the puppy goes so far as to allow his face to be licked by the cub, without manifesting anything but satisfaction. The owners have long wanted to try the experiment of raising a dog and lion together and are watching these two with much interest.



View in Zoo Cage Showing Scotch-Terrier Puppy and Cub Which have Lived Happily Together Since the Day the Cub Opened His Eyes: There Is Only a Day's Difference in Their Ages

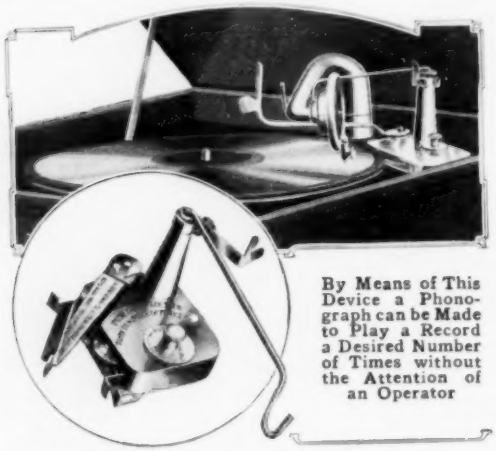
HARDY COOLIES SUPPLY WHOLE CITY WITH WATER



THE remarkable hardihood of Chinese coolies and the primitive conditions that obtain in many inland cities of China, are both illustrated in this picturesque photograph, taken at Chungking. Though having a population of between 600,000 and 700,000, this great commercial center has no modern sewage or water system. The city is situated on a high bluff, and all its water is brought from the near-by Yangtse River by thousands of water coolies, some of whom are here shown at their task. After toiling up the flight of 350 steps that ascends from the river level, the hardy men who offer the water for sale obtain about half a cent a bucket for it.

REPEATING ATTACHMENT FOR PHONOGRAPHS

By means of a phonograph attachment which is serviceable for many occasions, particularly when phonograph music is used for dancing, any record can be repeated automatically one to five times, or played continuously. The mechanism is nickelplated, having a base about three inches square, which is placed so that a friction wheel projecting from its side makes a contact with the turntable. Extending from an upright column is a hooked swinging arm on which the tone arm rests. A second adjustable member serves as a stop. After setting the latter and also an indicator, the phonograph will play a record the desired number of times without further attention.



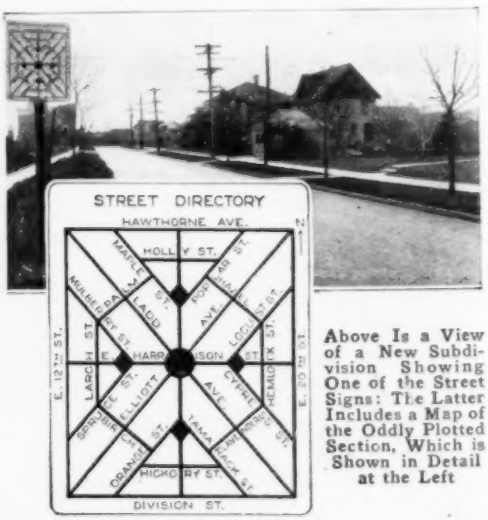
By Means of This Device a Phonograph can be Made to Play a Record a Desired Number of Times without the Attention of an Operator

DEPTH OF WATER AFFECTS VESSEL'S SPEED

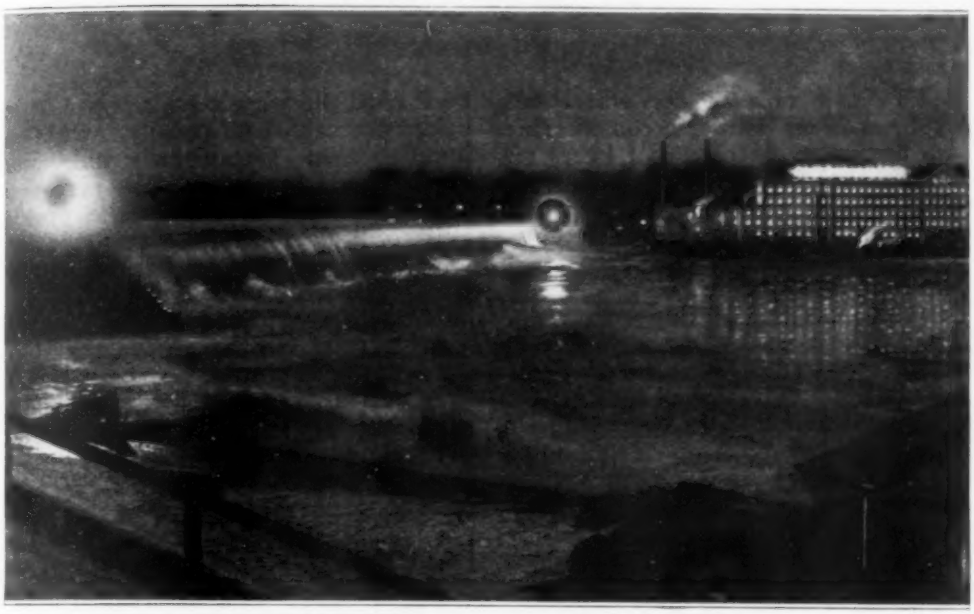
It has been found that to a certain extent the depth of water in which a vessel is running affects its speed. Not only is this true in very shallow water where the "drag" is obvious, but in the case of a 12,000-ton ship, for example, with a draft of 27 ft., the speed is somewhat lessened when the craft enters water 250 ft. deep. Speaking generally, the depth between a vessel's keel and the bottom should be 10½ times the draft in order to avoid all retarding effects. Another factor to be taken into consideration is whether the vessel is moving swiftly or slowly. A boat traveling at high speed requires more depth of water to prevent additional friction caused by the nearness of the ocean bed. Running at 10 or 12 miles an hour, a ship must have between 26 and 27 ft. of depth to escape this retarding tendency. Running at 22 miles an hour, it needs a depth of 104 ft. and in some cases much more.

ODD PLOT OF SUBDIVISION SHOWN ON STREET SIGNS

Large street signs, each of which is in reality a map of the vicinity, are to be found at the entrances to a high-class residence section which has recently been opened near Portland, Ore. The tract is rectangular and is divided by two streets that bisect each other at right angles. Extending diagonally through each of the four quarters so formed are three parallel streets which open onto the principal streets already mentioned. At the central intersection and at four near-by intersections are small parks. While this plan makes certain central points very accessible to all, it would be most confusing to strangers but for the unusual street signs.



Above Is a View of a New Subdivision Showing One of the Street Signs: The Latter Includes a Map of the Oddly Plotted Section, Which is Shown in Detail at the Left

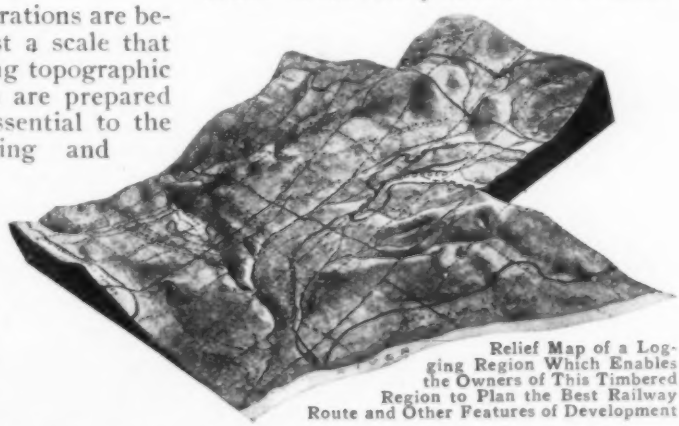


ILLUMINATE DAM TO PROTECT IT FROM ENEMY

WHILE searchlights have been installed at either end of the big power dam at Holyoke, Mass., on the Connecticut River, primarily to protect it from enemy sympathizers who might seek to damage it, and so cripple the near-by mills, this precaution has resulted in producing a beautiful night scene. The manner in which the powerful lights play on the smooth sheet of water and the swirling rapids is well shown in the accompanying night photograph of the dam, with the Hampshire Paper Company's mill on the right. Guards are maintained near the dam at all times.

RELIEF MAPS A BIG AID TO LUMBER FIRMS

Modern lumbering operations are being conducted on so vast a scale that many concerns are finding topographic and relief maps, such as are prepared by logging engineers, essential to the most economical cutting and handling of their timber. These maps give a vivid mental picture of the region to be worked. They show in detail such essentials as the elevations, the slopes, the water courses and the condition of the timber. Many firms now feel that they are to be preferred to personal visits to the region under consideration because the maps place all the data in the hands of several men instead of one or two. With them a group can lay out the best possible route for the logging railroad, which is the central factor in the profitable handling of timber in large areas. Such costly errors as establishing railroad grades that are too steep can be avoided, and accurate estimates as to the weight of engines needed can be made. In short, relief and topographic maps enable a lumber firm to lay out at the start a comprehensive plan for developing a tract.



Relief Map of a Logging Region Which Enables the Owners of This Timbered Region to Plan the Best Railway Route and Other Features of Development

LOADING AND UNLOADING CAR WHEELS BY MAN POWER

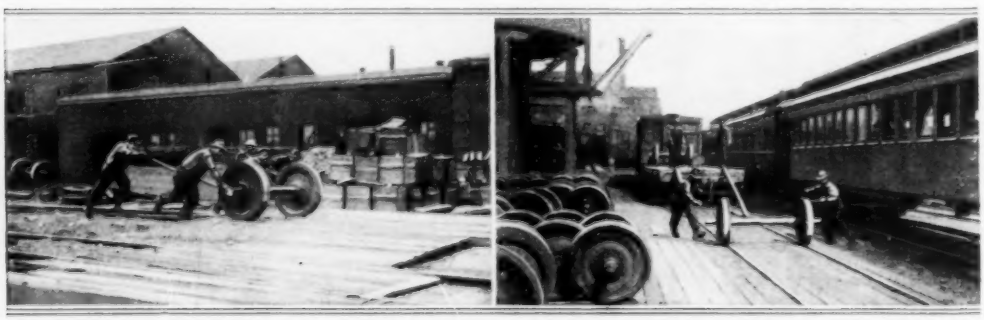
By J. E. MURPHY

AFTER a railroad car wheel has been in service for a considerable time the tread, or part that bears on the rail, becomes uneven with wear and the wheel must then be sent to a wheel lathe, where the tread is planed down to an even surface. The actual work of replaning the wheels is usually a smaller job than that of getting them to and from the lathe, as each pair of wheels, mounted on their axle, weighs in the neighborhood of two tons. In an industrial district of Chicago, that is busy day and night with the hum of labor-saving equipment, is a wheel-lathe plant where the work of unloading and loading the car wheels is done by "man-power" methods that are as old as railroading itself.

With the carload of wheels set on the track alongside the wheel yard, a skid having a rail for each wheel is placed against the end of the car so that it forms a steep incline down to the track. Each pair of wheels is then worked with steel bars to the end of the car and over the top of the incline. By the time they reach the track the wheels are traveling at high speed, and it takes skill and strength to stop them. This is done by the same method that a cowboy uses in catching a steer or pony—by lassoing. Two men, one on each side of the track, stand ready with wire loops, and as the wheels dash past them each throws his loop over the end of the axle and then runs and pulls back until the wheels are stopped, this being accomplished usually within a hundred feet. Occasionally only one of the loops holds. In that case the wheels are derailed, with the possibility of broken legs and other injuries for anyone that happens to be in the way. The work of loading is done by an equally primitive method. In this work a steel bar having a fork that fits over the end of the axle, and known as a "wheel stick," is used. Starting two hundred feet from the car, with two men to each "wheel stick," the wheels are pushed along the track with increasing speed until, as they reach the incline, they have the momentum for mounting to the car floor. In spite of their primitive nature these methods are likely to be used for many years, as they are the most economical yet devised for a plant where the number of wheels handled is too small to justify the use of a depressed track or the installation of air-hoist equipment.

MUNICIPAL HALL ERECTED OVER UNSIGHTLY CREEK

An unsightly stream running through the heart of Hutchinson, Kans., has been transformed into a thing of beauty, and what was once an undesirable location has become a site of special value. This change has been brought about by confining the creek in question within artistic walls,



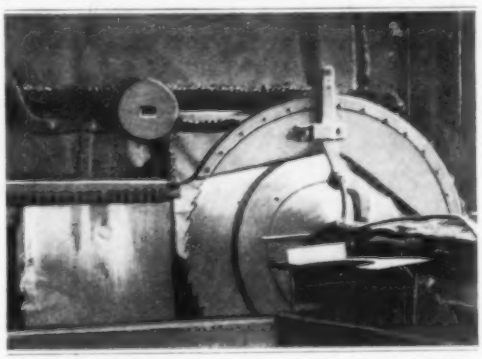
Right: While Dropping down the Incline the Wheels Attain a High Velocity; They are Stopped by the Same Method That a Cowboy Uses in Catching a Steer or Pony—by Lassoing. Left: Starting the Wheels for the Final Rush up the Incline to the Car Floor. The Same Skid is Used for Loading and Unloading

Municipal Convention Hall in Hutchinson, Kansas, Built Directly above a Stream: By Erecting This Attractive Structure, Together with Proper Retaining Walls, an Unsightly Location has been Changed into One of Value and Service

adorned with flower boxes and ornamental railings, and erecting a municipal convention hall directly over the water. The building is of reinforced concrete and pressed brick, and will seat 3,500. The rear portion of the main floor is designed so that it can be made to slope toward the stage or made level for dancing. By utilizing the site over the stream in this way, a central location in the city has been obtained at low cost, and what was an eyesore has become a place of beauty and public service. This improvement also made possible the widening of a narrow street.

GUARD FOR BIG BUZZ SAW PROTECTION TO WORKERS

To protect workmen against the danger of serious injuries, a deputy labor commissioner of a western state has designed a steel guard for circular saws which has given satisfaction during several months of use in a shingle factory. The device describes an arc and shields the upper third of a saw's circumference without interfering with its operation. Furthermore, the guard is arranged so that it may be readily tilted back out of the way to permit the removal of the tool. Its easy adjustment and comparative cheapness make it well suited for saws used for purposes that do not preclude the installation of such equipment.

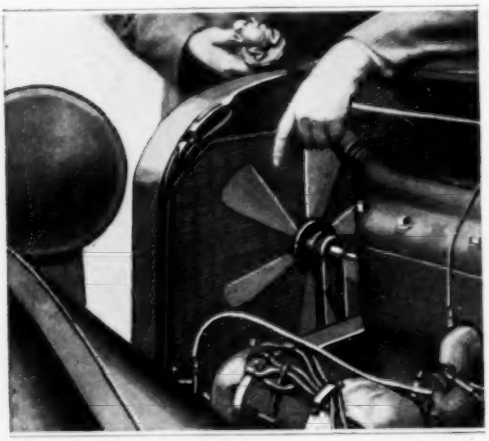


The Shield Covers the Exposed and Unused Part of the Saw's Circumference without Hampering Its Efficiency

¶ The state of Oklahoma has recently established a bureau of standards which will acquire facilities for testing gas, water, and electricity meters, and may test fuels. Standards of weights and measures will be possessed by it also.

FROG ON AUTO RADIATOR ADMITS MOIST AIR

Acting on the theory that engines in motor vehicles run more smoothly in damp or foggy weather, two inventors have patented a device by which outside air is sucked into the radiator of an automobile, mixed with the moisture therein, and conveyed to the carburetor air intake through a flexible tube. An acid-stained green frog, cast in brass and perched on the radiator cap, is the only part of the device visible. In the frog's throat is a valve which opens when the engine is running and permits the air to be sucked in. Mixed with the radiator steam it then travels downward through the overflow pipe to a water separator, with a trap which permits the discharge of all superfluous water, while the moist vapor travels to the carburetor. Elimination of carbon troubles and increased mileage are among the merits claimed.



Appliance for Conveying Moist Air to a Carburetor: The Man at the Left Holds the Brass Frog Which Admits the Air

¶An electrically operated machine gun has been invented in Switzerland, according to reports, which can fire more shots in a given time than any gun now in use, and fires without detonation.

CORN-PLANTER ATTACHMENT FOR MOTOR CULTIVATOR

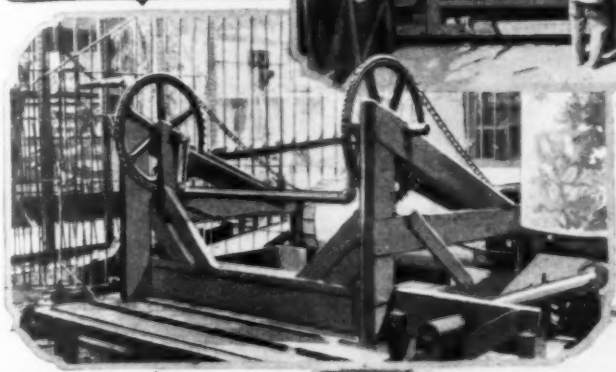
Among the farm implements of late design is a corn-planter attachment for a power-driven cultivator. To use the apparatus it is only necessary to remove the cultivator gangs from the bars to which they are fastened, and mount the other outfit in their place. This change can be effected readily, and the one machine made to serve the two functions with equal facility. The planter itself represents merely a reassemblage and adaptation of the parts of a standard horse-drawn machine.

Side View of the Machine, Showing It in Use as a Corn Planter

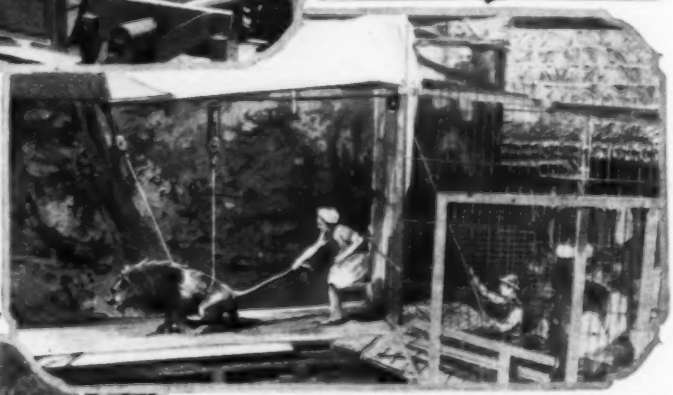
The Attachment is Applied by Removing the Cultivator Gangs from the Bars to Which They are Fastened, and Putting the Corn Planter in Their Place

STAGING A LION CHASE FOR THE MOVIES

Ingenious Faking for an Unusual Movie Scene: The Scenario Calls for a Lion Pursuing Two Men through a Jungle, While a Third Actor Clings Frantically to the Animal's Tail. The Trainer and Helpers are Here Shown in the Not-Too-Pleasant Task of Getting the Animal into Position on the Stage, Which is Built to Operate Like a Treadmill

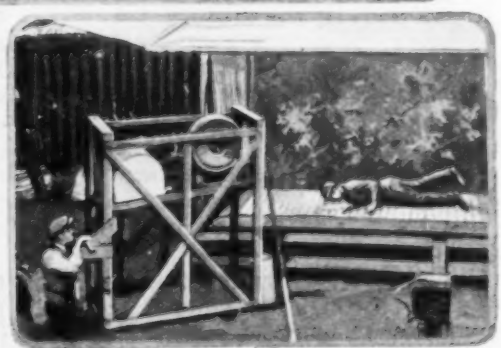


The Mechanism That Operates the Scenery: To Preserve the Illusion of Running through a Jungle, the Background is Made to Move in Unison with the Stage, Which Travels to the Right While the Actors, by Running, Keep in Front of the Camera. The Scenery is Constructed Like an Endless Belt



Rehearsing the Chase: In Retouching This Picture the Artist has Brought Out Two Wires That Are Invisible in the Movie Photographs. These Pass over Pulleys (Also Not Shown in the Films) to Attendants Who Are Ready, the Instant the Lion Threatens to Make Trouble, to Draw Him Up off His Feet and So Render Him Powerless

The Arrow Points to a Concrete Pool, Six Feet Wide and Six Feet Deep, into Which, in Time of Danger, the Actors can Plunge and Escape from the Lion, Who will Not Follow Them into the Water



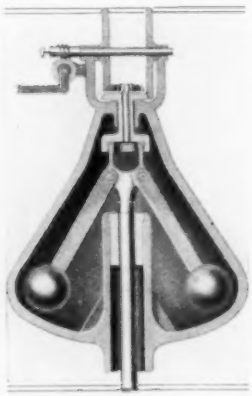
In the Foreground, at the Left, Is a Portable Blower Which Directs a Blast against the Actors, Giving Them the Appearance of Running against the Wind. The Player's Posture Involves Risk When the Lion Is Present, for the Beast may Seize Him Before He Gets Up

NOTCHED CURB EXCLUDES AUTOS BUT NOT CYCLES

An ordinary driveway leading to a motorcycle garage formerly permitted many motorists to drive into the building by mistake, thinking that it was an automobile garage. To put a stop to this practice, the owner cemented up the drive and installed a regular curb. However, he did not intend to inconvenience his motorcycle patrons, and so provided a 16-in. notch in the curb, which enables them to mount the sidewalk without difficulty.

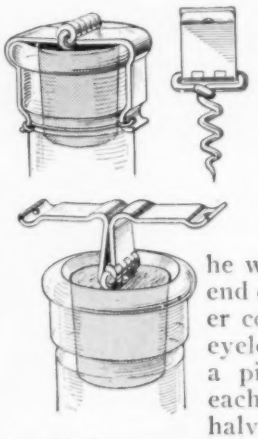
QUICK RESPONSE FEATURE OF TURBINE GOVERNOR

To enable closer regulation and greater stability than are usually attained, a governor for steam turbines and water motors has been designed that possesses a number of interesting points. Simplicity of construction is one of its outstanding features, but more important, perhaps, is its principle of operation. Instead of being the controlling power, centrifugal force is used only for setting the clutches of the regulator. The rapid rotation of the governor shaft operates the valves. Quicker response is said to be obtained in this way than if sole dependence were placed upon centrifugal force. Short fingers project above the pivots of the fly-ball arms and carry quadrant clutch jaws at their extremities. Between them is a disk clutch and around them a cup clutch. They run smoothly between these members until the speed increases, or decreases, about one per cent. When the former occurs, the jaws grip the inner disk and cause the governor shaft to operate the valve-control rod. A decrease in speed effects the engagement of the outer clutch, and the rotation of the gearing is reversed.



FOLDING CORKSCREW USED IN SEALING BOTTLE

An inexpensive folding corkscrew has been invented which, if desired, can be placed on a bottle at the time that it is sealed in the bottling works, so that the purchaser may have no inconvenience in opening the container whenever he wishes. The upper end of the screw proper consists of a broad eyelet which serves as a pintle to hinge to each other the two halves of which the handle is composed. These two halves are bent at right angles and fold down against the top and neck of the bottle. If desired a sealing wire can be run through holes and the handle tied down. To use the corkscrew it is only necessary to remove this wire and turn the two parts of the handle up until they form a horizontal bar which can be grasped by the hand.



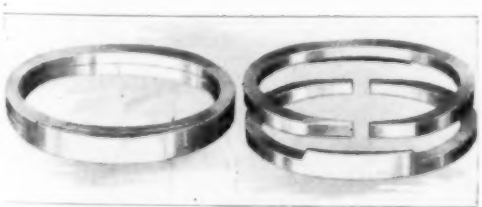
¶Coats can now be discarded by St. Louis motormen and conductors during hot weather without fear of official disapproval. The local street-car company has provided these employes with two gray shirts and two blue ties, each, which they will be permitted to wear without their coats.

CARBON MONOXIDE POISONS MANY IN MODERN PLANTS

In many industries, notably in the steel and other metallurgical lines, the hazard from chronic carbon-monoxide poisoning is increasing steadily, according to a report recently issued by government officials. By chronic poisoning is meant the serious effects resulting from the continued presence of small quantities of this gas in places in which laborers are employed. The final result of such exposure, which causes no acute symptoms and hence is often ignored, is partial or total disabling of the worker. In modern industry carbon monoxide appears frequently as a product or a by-product of numerous processes. For example, gas formerly allowed to escape is now utilized for the production of steam and power. This poisonous gas is also made in large quantities in gas producers and the gas engine is gradually being substituted for the steam engine in modern plants. All of these factors help to increase the probability of gradual poisoning of the men working where the gas is used, and create a condition demanding special study.

NEW PISTON RING HAS NO OUTSIDE JOINTS

A new piston ring, having no outside joints to permit leakage and no exposed ends to score the cylinder, consists of two identical circular members, each with a flangelike extension midway between its ends. The two parts fit together so that each flange overlaps and protects the ends of the other member, thus forming a ring requiring no device to unite the halves.



Two Views of a New Piston Ring, Having No Outside Joints and No Exposed Ends to Score the Cylinder

SMART MOTOR APRONS WORN BY WOMEN DRIVERS

Women motorists in some sections are adopting attractive driving aprons that protect their delicate summer gowns from dust and grease. They are made of durable linens and crashes, tastefully trimmed, and so designed that they may be put on or removed readily when entering or leaving a machine. Since they are modish and pleasing, they may be worn during shopping tours and similar excursions without being taken off when a car is parked. They have the advantage, also, of being serviceable rather than conspicuous.

Dainty Summer Frocks are Protected from Dust and Dirt by Tastefully Designed Aprons Intended for Women Drivers of Open Cars

READING RACK OF GLASS FOR BED PATIENTS

A glass shelf, fastened by folding supports to the head of a bed, is the essential feature of a book or magazine holder with the aid of which one can read with comfort while lying down. The invention is particularly serviceable to wounded soldiers and in-

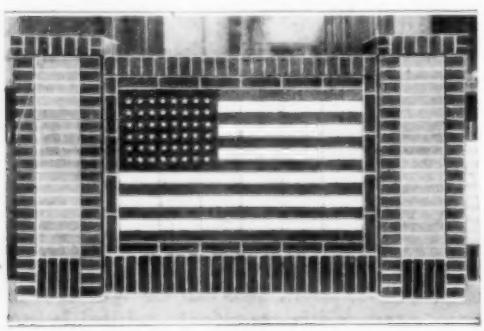
valids. The reading matter is laid face down on this shelf so that the person in the bed can look up through the glass

The Shelf of This Reading Rack Is of Glass; Reading Matter is Placed against It, Face Down, Enabling a Person Lying in Bed to Read with Comfort

and see the printed page. When the device is not in use it is folded out of the way, against the head of the bed.

STAR-SPANGLED BANNER MADE OF BRICK

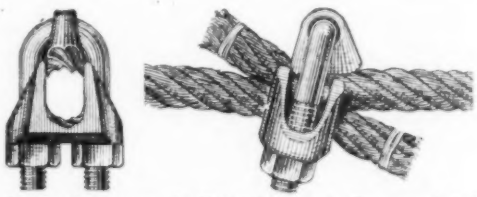
What is undoubtedly one of the most enduring flags that has ever been devised is the national emblem made of red, white, and blue brick to ornament the office of a brick company. The flag measures 48 by 32 in., and is flanked on either side by brick pillars. The red stripes consist of red, vitrified brick, and the white stripes of matt, glazed brick. Dark blue-enameled brick compose the field for the 48 stars. The designer of the flag did not believe it practical to make the stars of the same material as the rest of the flag but the masons insisted that it could be done and painstakingly chiseled out the 48 five-pointed stars from white brick.



Stars and Stripes in Durable Form: A Brick Reproduction of the Flag, Measuring 48 by 32 Inches. The Stars were Cut from White Brick with a Chisel

SPLICING CLIP FOR CABLE IS SELF-TIGHTENING

For splicing wire rope, a self-tightening clamp has been devised that seems to have merit. It consists of a U-bolt, in the crotch of which a movable cam is attached, supplied with a base that has high, flat sides. Both the cam and base are scored to match the strands of a cable, much as the threads of a nut fit those of a bolt. This arrangement not only gives the device greater bearing surface than it otherwise would have, but also prevents injury to the rope. When the cable is subjected to unusual strain, the cam may turn slightly so that its grip is increased

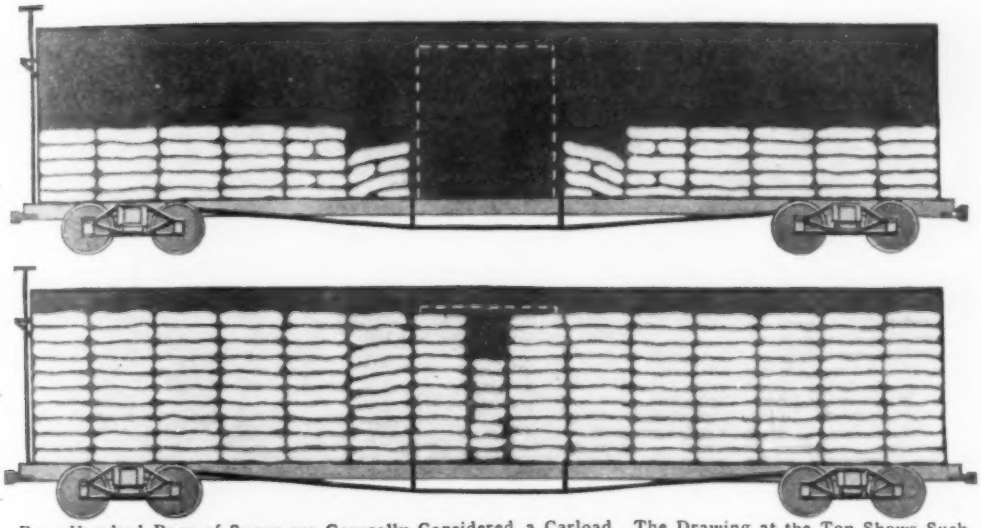


As the Pull upon the Spliced Cable is Increased the Clamp Tightens Its Grip

and the spliced ends of the rope are prevented from slipping. A device of similar construction is used as a bar splicer.

WASTED SPACE ONE REASON FOR GREAT CAR SHORTAGE

As a means of promoting railway efficiency in the interest of national defense, shippers the country over are being urged to make one car accomplish the work of two by utilizing its maximum capacity instead of wasting half the space it offers. In promoting this campaign, the Pennsylvania Railroad Company has prepared a series of



Four Hundred Bags of Sugar are Generally Considered a Carload. The Drawing at the Top Shows Such a Cargo, While That below It Illustrates How the Same Car can be Made to Carry 1,000 Sacks by Simply Utilizing the Available Space

charts that explain one of the reasons for the so-called car shortage and offers tangible suggestions for its solution. It is pointed out, for instance, that the average carload shipment of fertilizer during the month of March amounted only to 250 bags weighing 42,000 lb., while 600 bags, or 100,800 lb., could have been accommodated. In the case of sugar, 400 sacks constitute the commercial selling unit and are considered a carload. The company shows, however, that 1,000 bags can be shipped in one of its cars. Several other illustrations of similar character are offered. To remedy the condition, the railway suggests that, when possible, buyers increase their orders to actual carload lots, or club with other purchasers. Shippers on the other hand are asked to "do their bit" by encouraging larger trade units and urging customers to merge their orders.

ELECTRIC DOOR CONTROLLER FOR PASSENGER LIFTS

Underwriters have passed an electric safetv appliance for passenger elevators which eliminates the dangers of operation by controlling the movements of a car and the doors of the shaft in which it travels. It is primarily mechanical in its actions and entirely automatic in performing them. It prevents a door being opened until an elevator has come to a full stop with its floor within a prescribed number of inches of the landing level, and further prohibits the movement of the car until the gate has been locked. Each door of a shaft is controlled independently, but only one can be opened at a time. In opening it, a door is moved manually about an inch. This action

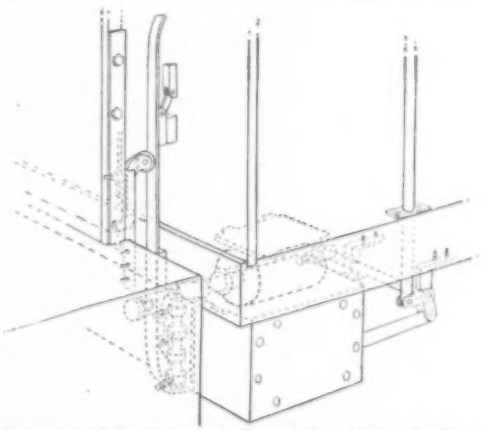


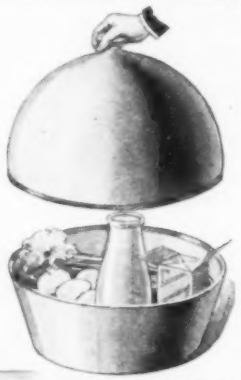
Diagram of Apparatus as Installed on Electric Elevator: The Square Box below the Floor of the Car Contains the Switch, While the Cylinder Shown in Dotted Lines Is a Solenoid, Which Actuates the Cam That Locks and Releases the Latch

operates a switch and actuates a solenoid that releases the lock. When the gate is closed, the cycle is reversed.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

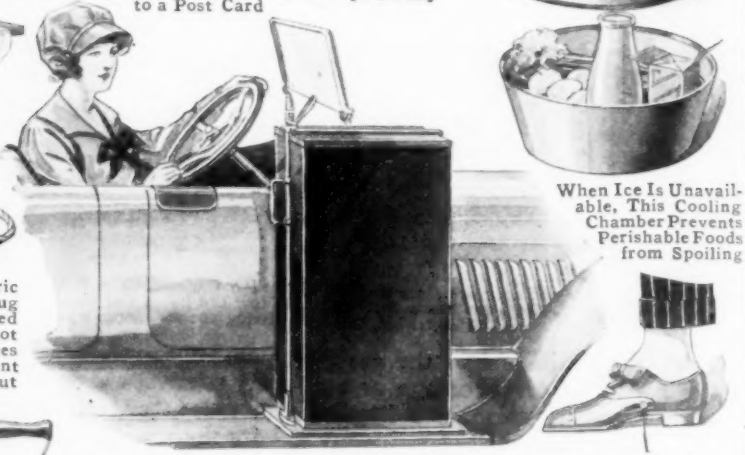
There Are a Dozen Different Uses for the Shelf Pictured Above. A Single Nail Holds It in Place. Price 40 Cents

Coins and Other Small Articles may be Sent through the Mails Quite Safely When Placed in This Metal Receptacle, Which Clamps Firmly to a Post Card



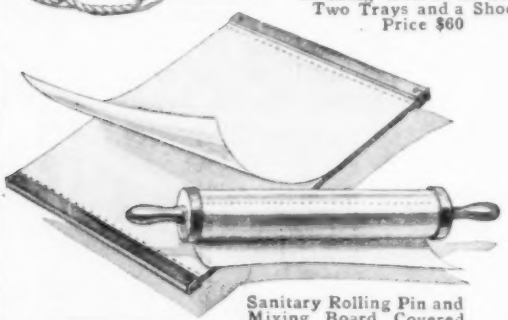
When Ice Is Unavailable, This Cooling Chamber Prevents Perishable Foods from Spoiling

For Electric Irons, the Plug Above is Provided with a Small Pilot Lamp That Indicates Whether the Current Is On. Price About $1.25



Showing a New Motor-Car Trunk, in Which Clothing Hangs in Natural Position, Locked to Running Board: It Contains Two Trays and a Shoe Box. Price $60

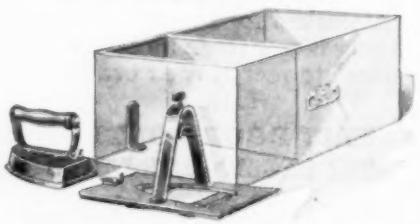
Small, Unnoticeable Vent That Provides Ventilation for Shoes of Any Type: It Is Waterproof and Readily Attached. Price, Pair, 25 Cents



Sanitary Rolling Pin and Mixing Board Covered with Many Thicknesses of Waxed Paper: Sheets are Torn Off as Used. Price of Each About 50 Cents

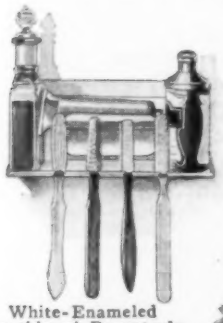
Simple Riveting Outfit That Enables One to Mend Quickly and Permanently Holes in Aluminum, Tin, or Other Cooking Utensils

Sanitary, Odorless Garbage Receiver That does Not Spill Its Contents When Overturned: A Rubber Bumper Allows It to be Closed Noiselessly. Price $7



Ingenious Electric-Iron Holder That may be Clamped into Drawer of Wardrobe Trunk: The Device Eliminates the Difficulty Usually Experienced When a Traveler Wishes to Carry an Iron

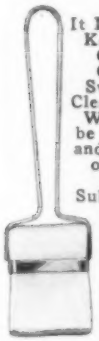
INTENDED FOR THE HOME AND ITS MEMBERS



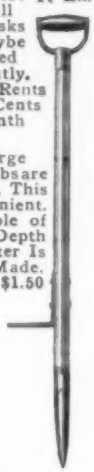
White-Enameled Toothbrush Receptacle with Places for Liquid, Powder, and Paste Dentifrices. Price 25 Cents

Something a Bit Out of the Ordinary for Nursery or Porch: Jack and Jill Lamps with Sockets for Connection with Lighting Circuit. Price, Pair, $7.50

Compact Filter That Minimizes the Danger of Using Ordinary City Water for Drinking Purposes: It Employs Small Filtering Disks That may be Replaced Frequently. Device Rents for 30 Cents a Month



It Is Easy to Keep This Griddle Greaser Sweet and Clean, for the Wick may be Removed and Washed, or Fresh Fabric Substituted. Price 25 Cents



When a Large Number of Bulbs are to be Planted, This Tool Is Convenient. With It a Hole of the Proper Depth and Diameter Is Quickly Made. Price $1.50

The Flexible Trellis Forming the Artistic Arch Above, Folds Compactly, as Illustrated at the Right. It may be Dismantled Each Fall and Stored for Winter

Attractive Knitting Bag with Compartment in Bottom to Hold Needles, Scissors, and Other Necessities: It Is of Convenient Size and Made of Pleasing, Durable Material. Price $5.50

When a Large Quantity of Apple Butter is being Made, This Wooden Stirrer Is Serviceable. The 18-Inch Blade is Provided with a Six-Foot Handle. Price $1.50

First-Aid Outfit Packed in Strong Metal Box of Convenient Size for Motorists, Campers, and Others: It Contains Antiseptics, Salve, Cotton, Pins, and an Assortment of Gauze

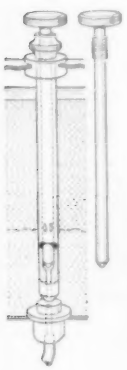
For Containers of Syrups and Similar Products, a Cover Fitted with a Spout That, When Closed, Seals the Receptacle, Is Convenient. It will Cost About 25 Cents

TREAD OF TIRE REINFORCED BY INTERMESHED WIRES

Vulcanized near the surface of the tread, four triangular coils of steel wire, arranged parallel with one another, encircle a new type of non-skid, puncture-resisting tire for motor cars. The points of the wires become exposed after the tire has been given slight use, and are supposed to grip the road and also prevent pieces of glass and other sharp material from penetrating the rubber and cutting the fabric. The reinforcement which the wires provide, and the heavy weight of the fabric used, contribute to make the casing durable.

VALVE KEEPS RESERVE IN MOTORCYCLE FUEL TANK

A gasoline-supply valve for motorcycles has been invented, which is so constructed that it gives the rider warning when all but about half a gallon of fuel has been drawn from the tank. The valve is in the form of a hollow needle, and has a set of holes a little above the lower end. In it is inserted a second needle, or pin, which can be screwed down to close the outlet in the lower end of the hollow needle. This double device is fitted to the fuel tank so that the outer needle fits tightly over the tank's outlet. When there is an ample supply of gasoline the outer needle is screwed down tight to this outlet and the fuel flows through the holes in the needle's side and down to the pipe leading to the carburetor. But when the level of the gasoline falls below these holes the rider knows that his supply is almost gone, for it stops flowing. To draw on the remaining supply he must open the valve in the bottom of the tank. This is done simply by giving the outer needle a few turns upward. This double valve can be completely closed by screwing the hollow needle down into the outlet, and then screwing the pin down as far as it will go, so that it shuts off the flow through the holes.

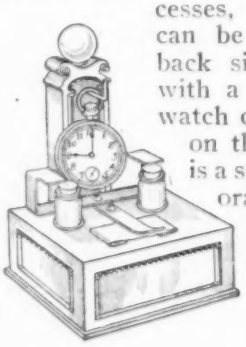


MOISTURE-PROOF COVERING FOR TENNIS RACQUET

To protect the strings of a lawn-tennis racquet from the injurious effects of moisture, a rubber-treated cloth mitten has been devised. It fits over the head of a racquet and is strapped about the neck so that the gut is not allowed to absorb dampness from the atmosphere and thereby become flabby. The use of the accessory does not prevent one from keeping a racquet in a press.

MEDICINE STAND PREVENTS ERRORS IN TAKING DOSES

In the top of the medicine holder shown herewith are two felt-lined recesses, in which bottles can be placed. At the back side is an upright with a hook on which a watch can be hung, while on the top of the base is a spring to hold memoranda. Also fastened to the base is an oscillating guard with arms so arranged that it prevents the removal of the cork from one or the other of the bottles. On taking one kind of medicine,



the guard can be shifted so that only the other bottle will be accessible for the next dose. Thus, when medicines are taken alternately, mistakes are guarded against.

STEAMER AND STERILIZER FOR BARBERS' TOWELS

For heating and sterilizing towels in barber shops a steaming appliance has been designed which appears to have some serviceable features. It consists of a reservoir mounted on a metal standard and supplied at the top with a white-porcelain receptacle with capacity for about 10 towels. It holds two or three gallons of water and is fitted with a gas, gasoline, or electric heating system, according to the needs of the individual purchaser. Towels are kept in the holder provided for them, and removed as required. Since they are steamed instead of being placed in hot water, they can be handled without discomfort and applied to a customer's face without having to be first wrung out. They are also heated to a sufficient degree to kill all germs, a thing which safeguards customer and barber alike. The boiler is fitted with a gauge and faucet, and supplies hot water for shaving and other purposes in shops not equipped with stationary bowls before each chair.

CONVENIENT VALVE GRINDER FOR AUTOMOBILE ENGINE

For grinding the valves of a motor-car engine, a convenient device has been introduced which lessens the time and exertion usually consumed in such operations. Separate mountings are available so that the tool may be used on either motors with detachable cylinder heads, or those with removable spark-plug bases. The grinding post is held down by a stanch spring so that the contact of the valve head and seat is true and the pressure adequate. A particularly good feature is that any number of valves may be ground in a single operation by employing several of the instruments and connecting them with a rod so that all of the valves are oscillated on their seats simultaneously.

SELF-LUBRICATING SHEAVE SAVES WORKMEN'S TIME

Because a new type of sheave is self-oiling it is especially suited for use on cableways or machinery difficult of access. It requires replenishing with lubricant but once in about two weeks, whereas many common sheaves need oiling once or twice a day. The portion of the wheel between the grooved circumference and the axle bearing constitutes an oil chamber of about three quarts' capacity. A plug in each side of the reservoir makes it easy to replenish it with oil. There are special bronze bushings, provided with oil holes through which the lubricant flows evenly and continuously from the chamber.

¶Authorities estimate that during the next 12 months the government will need 2,000,000,000 ft. of lumber for war purposes. Great as this total is, it is only about five per cent of our lumber production for one year.

SCHOOL CHILDREN AT NEW TASKS AND AT PLAY.

Since "Toothbrushing Classes" Like This Became a Feature in All Kansas City Schools the Children are Taking Better Care of Their Teeth, Aches Are Fewer, Health Is Improved, and Lessons are Learned Easier

Four Des Moines Schoolgirls Who have Found That Operating the School's New Mimeograph Is Lots of Fun as Well as Good Office Training. Hence There Is Much Rivalry to See Who shall Run Off School Programs

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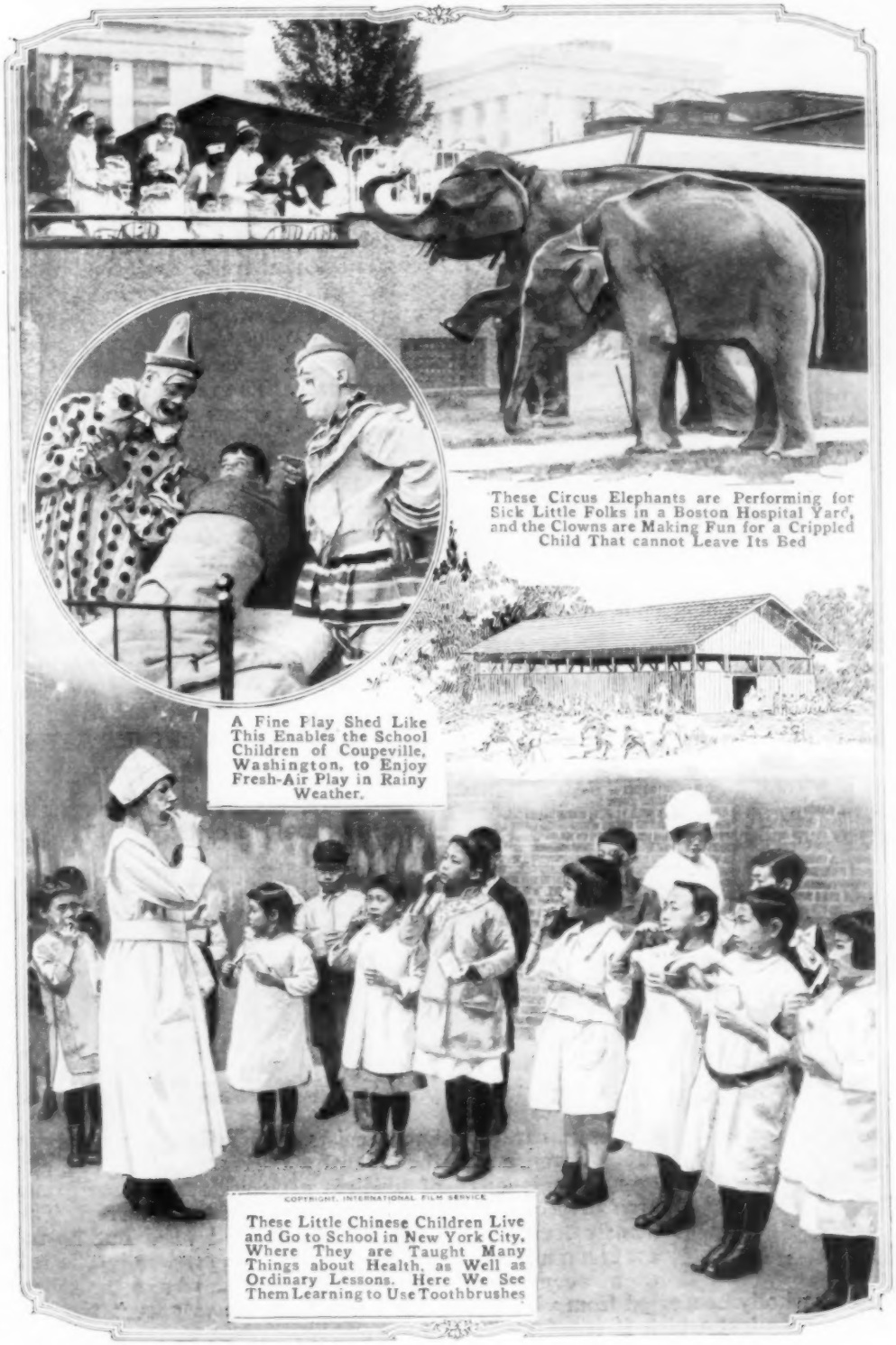
Left: At 16, Delia Damon, a Massachusetts Girl, Is Champion Girl Scout of United States and Canada. She is Wearing Medals Won in a Score of Activities

It Is Oil, Not Water, That is Flowing from This Pipe. The 12-Year-Old Girl Who Stands Close By, Is Owner of This and Other Oil Properties near Cedar Bayou, Texas, That Pay Her Hundreds of Dollars per Week



These Circus Elephants are Performing for Sick Little Folks in a Boston Hospital Yard, and the Clowns are Making Fun for a Crippled Child That cannot Leave Its Bed

A Fine Play Shed Like This Enables the School Children of Coupeville, Washington, to Enjoy Fresh-Air Play in Rainy Weather.

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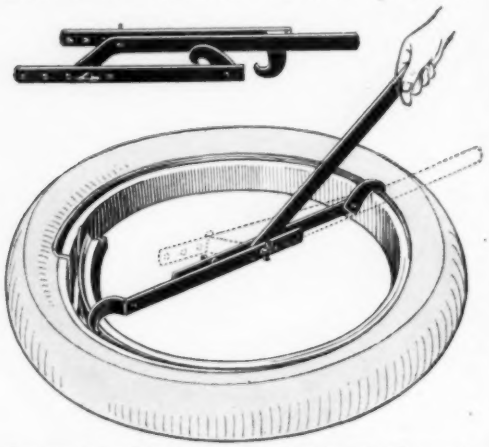
These Little Chinese Children Live and Go to School in New York City, Where They are Taught Many Things about Health, as Well as Ordinary Lessons. Here We See Them Learning to Use Toothbrushes

ADJUSTABLE RIM TOOL FOR TIRE REMOVAL

A new tool for the removal of automobile tires consists of two adjustable

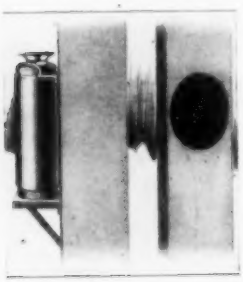


Contracting a Rim with a New Tool for Tire Removal: The Tool Is Adjustable to Any Size of Rim

bars connected with thumbscrews to a handlebar, by which the tool is expanded or contracted when the rim is engaged by lug hooks at the outer ends of the bars. The tool may be adjusted to various-sized rims by merely changing the thumbscrews to different holes spaced along each bar. It is made to fit any one-piece split, demountable auto rim, and enables the tire to be removed without injury.

FIRE-EXTINGUISHER POSTS MARKED WITH RED SPOTS

On the back of each post which serves as support for a fire extinguisher in a manufacturing plant, a red oval has been painted as a guide to employes in case of fire. Because of this conspicuous sign they can instantly locate an extinguisher even though it may be wholly concealed from view by the post against which it stands.



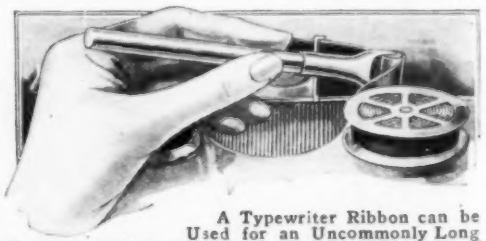
CONTRACTS LET FOR FLEET OF U-BOAT CHASERS

That the Navy Department has made extensive plans for fighting submarines is indicated by the fact that orders recently were placed for the construction of 345 wooden U-boat chasers, each measuring 110 ft. long and having a 15-ft. beam. The total cost of these craft, exclusive of engines, interior fittings, wireless, and other equipment, will be $32,000,000, of which $21,000,000 will go to private yards which have contracted for 210 of the boats. The remainder are being built by the various navy yards as follows: New York, 60; New Orleans, 6; Charleston, 8; Norfolk, 21; Mare Island, 15, and Puget Sound, 25. Construction is being rushed at all these points; the New York yard planned to turn out its order at the rate of 10 per month.

Contracts have also been let for 600 engines for the chasers, some of 220 hp. and others of as little as eight horsepower.

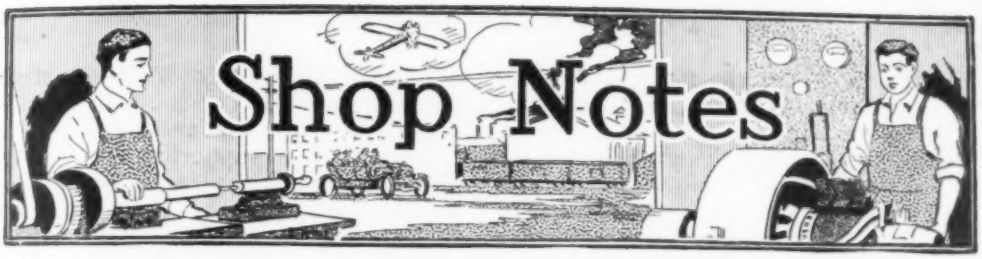
RE-INKER LENGTHENS LIFE OF TYPEWRITER RIBBON

A re-inking device which greatly lengthens the life of a typewriter rib-



A Typewriter Ribbon can be Used for an Uncommonly Long Period by Re-Inking It Occasionally with This Simple Device, Which Feeds Ink from a Wick to the Roller

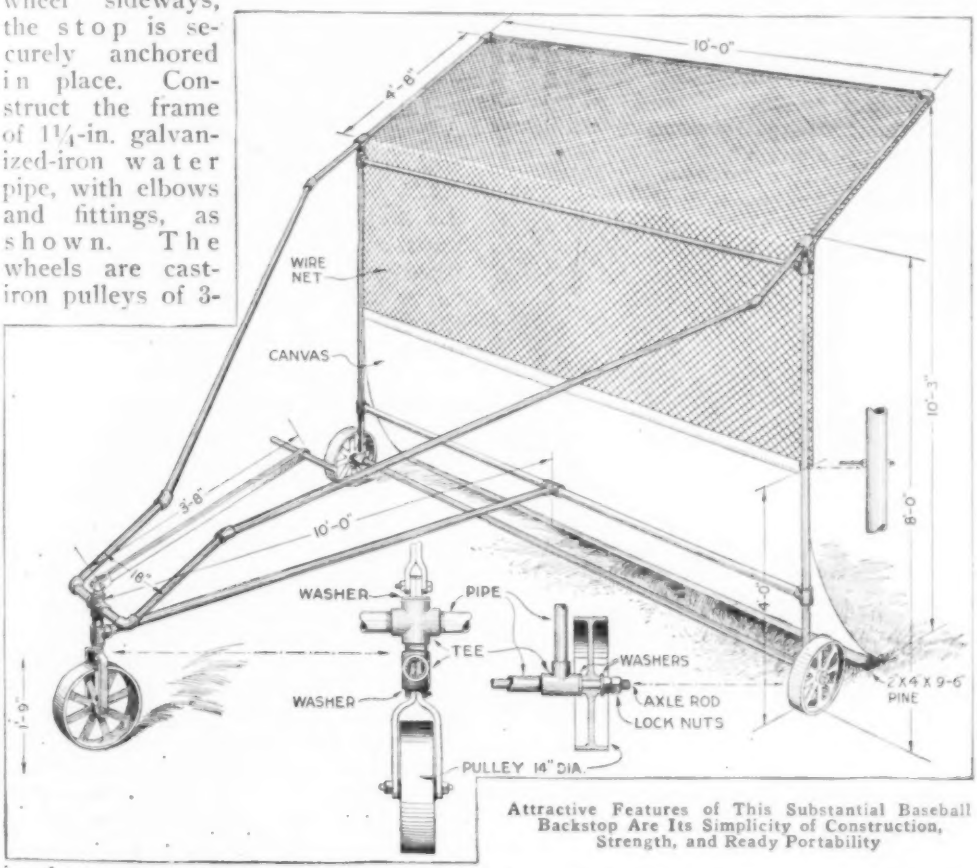
bon consists of an ink-filled tube about the size of a fountain pen, in one end of which is a felt wick that rubs against a roller, when the latter is turned. The ribbon to be treated need not be removed from the typewriter but is fed between a hooked guard and the roller, which transfers the ink from the felt to the ribbon.



A Portable Baseball Backstop Built of Pipe and Wire Netting

By P. P. AVERY

INSTEAD of the common makeshifts, a substantial portable baseball backstop was installed by a ball club, and proved popular and very practical. It may be wheeled to various positions and even transported to a distant field. By turning the front wheel sideways, the stop is securely anchored in place. Construct the frame of 1¼-in. galvanized-iron water pipe, with elbows and fittings, as shown. The wheels are cast-iron pulleys of 3-in. face, secured to the bottom cross member, as detailed. Secure the steering wheel by a fork made of ½ by 1½-in. band iron, bent to shape, as shown, and for a bearing use a heavy washer. The top part of the fork is rounded and riveted together to pass through the pipe connections. Drill a ½-in. hole at the top and fasten the fork to the handle, of ⅜ by 1¼-in. iron, 3 ft. 8 in. long, arranged to be swung back when not in use.



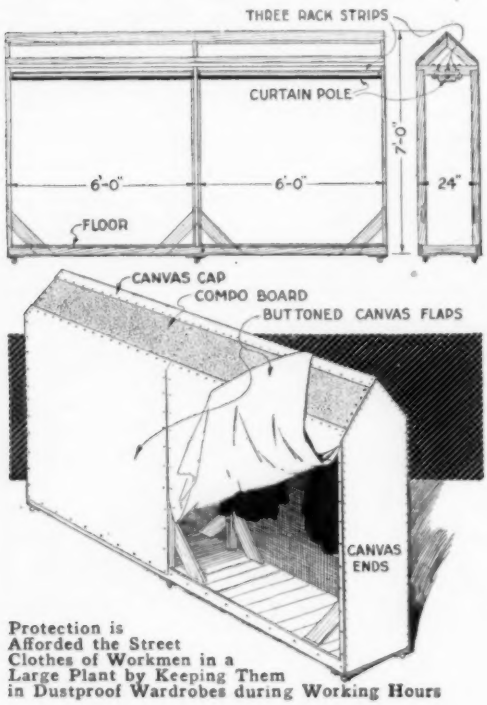
Attractive Features of This Substantial Baseball Backstop Are Its Simplicity of Construction, Strength, and Ready Portability

A net of heavy galvanized-wire mesh

is stretched over the main frame, and heavy duck, or canvas, is fitted over the lower section. Secure the wire mesh by heavy galvanized-iron wire wrapped around the pipe. The canvas is secured by lapping it over and sewing it. A basket may be slung under the lower front rod, in which baseballs, bats, gloves, etc., may be carried.

Canvas-Covered Wardrobe Protects Workmen's Clothes

Considerable dust collects on the clothes of workmen and employes in



Protection is Afforded the Street Clothes of Workmen in a Large Plant by Keeping Them in Dustproof Wardrobes during Working Hours

shops and workrooms in spite of precautions unless a covered inclosure is provided for them. In a large manufacturing establishment, wardrobes like that shown in the illustration are provided for this purpose. Each employe has a numbered clothes hanger and a portion of a hat rack above its place on the curtain pole, as shown. The clothes are placed in the wardrobe as the employes report for work, and are ordinarily not removed until the lunch hour. The framework for the wardrobe is built up of 2 by 4-in. stuff, strongly braced. The hat rack is made of three strips set under the gable. The curtain pole is supported by wooden blocks, bolted into place. The dimensions shown may be varied to suit special needs. The frame is set on casters and can be moved handily. The gable is covered with compo board and the sides and ends with canvas. The side curtains are buttoned securely into place when the clothes are placed in the wardrobe.—Charles M. Petersen, Buffalo, N. Y.

Typewriting on Tracing Paper for Blueprint Reproduction

In making duplicate copies of manuscripts having inset illustrations, or in reproducing specifications, the blueprint process is often the most convenient. To letter a considerable quantity of text is tedious, and, if properly done on a typewriter, the result will be more satisfactory. Tracing cloth, or tracing paper, preferably of the unglazed onion-skin variety, may be used. In writing the text on the typewriter, reverse a piece of carbon paper under the tracing paper, so that the impression is made on both sides of the sheet. This will give density, and make the blueprints sharp. If white prints with dark lines are desired, a new sheet of carbon paper should be used, and this taken as the negative in making the prints.

Enlarging Cylinder Fins Aids in Cooling Engine

Repeated overheating of the cylinders of an air-cooled gasoline motor led to experimenting in an effort to prevent this trouble. The result was the fitting of disks, or split rings, of sheet copper, around the cylinder, between the smaller fins cast on the cylinder. The rings were bolted into place, becoming practically a unit with the cylinder. The heat is radiated rapidly, and the cylinder is kept cool in spite of heavy running of the motor.

A Traveling Crane for the Farm

On a large farm, operated with heavy traction engines and other machinery, a method of moving or lifting heavy weights is often necessary. This traveling crane is on a farm at Williams, Calif., and pays for its cost every year in time saved in making repairs or doing other heavy work. The construction can be simplified greatly, to fit the needs of smaller farms, where only a small range is necessary.

The supporting structure is of heavy timber, made in standard braced construction, with posts securely set into the ground. The horizontal beams carry steel rails, on which the carriage rides. It is drawn along by a rope arrangement, which extends, through pulleys, to both ends of the framework, making it easy to move the carriage and load by drawing on the proper rope. The ends of the rails are guarded to prevent the carriage from rolling off. The carriage consists of a cross I-beam, braced to two wooden supports, in each of which two flanged

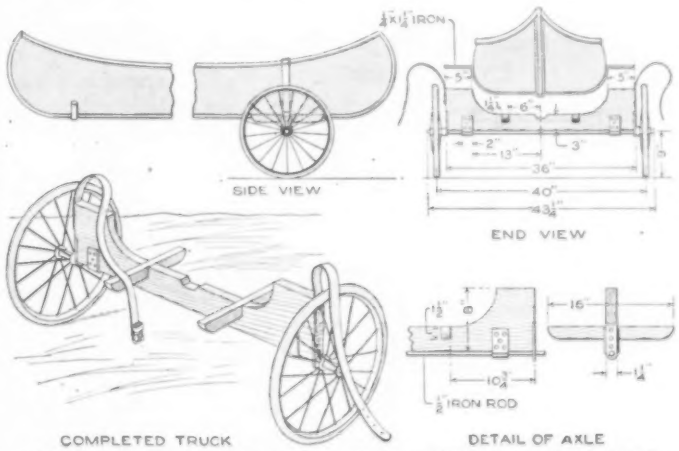
When the Farmer or an Employe Is a Trained Mechanic, Even Heavy Machine Work can be Done on the Farm with the Aid of a Crane

wheels are mounted. These engage the steel rails. The load is supported from the I-beam by a differential pulley, or other tackle. The tackle should be suspended from a trolley, which rides along the I-beam.

A Truck for a Canoe or Small Boat

A canoe must frequently be carried over a trail, or other place, and this work is made convenient by the use of a small truck made of two rubber-tired baby-carriage wheels, suitably mounted. A piece of ½-in. iron rod is used for the axle, as shown. An old trunk strap, two iron clamps, two small wooden brackets, and a carrying handle of ¼ by 1¼-in. band iron are the fittings used.

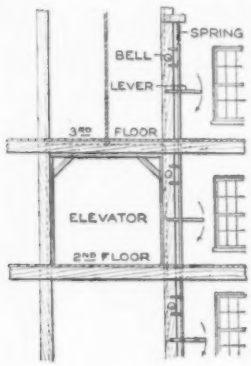
To make the truck, cut the main piece of 1¼-in. oak, and outline the lower section of the canoe on it, as shown. Make the cross brackets, used to keep the truck steady, and fasten them with screws. Fit the axle into a groove under the main piece, and attach it by clamps, as shown. Secure the wheels with washers and cotter pins. Attach heavy trunk straps at the ends. To use the truck, set the canoe in place, and buckle the strap around it, as shown. The iron carrying handle is placed under the opposite end. The entire outfit can be carried, knocked down, in the canoe. —J. A. Downs, San Francisco, Calif.



This Canoe Truck, Made of Baby-Carriage Wheels, can be Knocked Down and Carried Handily in the Craft

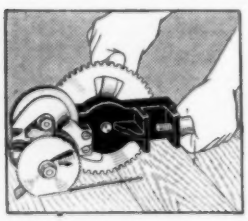
Gong Warning System for Freight Elevator

A simple mechanical safety device that will give returns in the way of immunity from freight-elevator accidents can be rigged out quickly. Gongs are fitted to the frame of the elevator, at each floor, 6 ft. above it, with the handles below the bells. On the top floor, a coil spring is arranged which pulls the connecting rods back to the original position after use. A conspicuous card near each handle reads: "Ring Bell before Using Elevator." The bells are the usual trip-gong pattern. The pull rods and handles are of flat stock, iron or soft steel, 3/16 by 3/4 in. Round stock can also be used, but requires more work to make the proper connecting joints. The use of jam nuts makes a better job.—S. A. Seipel, Indianapolis, Ind.



Cutting Floor Openings with Hand Circular Saw

In removing a few sections of flooring to install pipe or wiring, a handy way of cutting the boards, especially across the grain, is to use a small circular saw. This can be mounted on the spindle of a hand emery grinder, as shown. A handle should be fitted to the frame of the grinder, to steady it, and a projection added to rest on the floor and aid in gauging the depth of the cut. An old plane blade is useful in cutting the tongue from the flooring.—E. C. Galbreath, Denver, Colo.

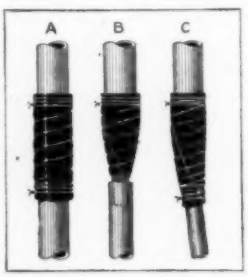


Wire across Lamp Relights Acetylene Flame

Thin piano wire placed slightly above and at right angles to the acetylene flame of an automobile tail lamp has been found efficient in preventing the light from going out without the knowledge of the driver. The wire becomes incandescent, and reignites the gas when the flame is jolted or blown out. The wire should be drawn taut, so that it is continually in the flame.

Roofing Paper as Emergency Pipe Connection

A quick, cheap, and satisfactory connection for pipes, to carry liquids not under pressure, can be made from a piece of one-ply roofing paper. Roll the paper into a tube of double thickness, as indicated at A, and tie it into place with wire or cord. Pipes of different sizes can be joined in this way by the methods suggested at B and C. Pipes that are out of line can thus be connected, as shown at C, and by using heavy paper, and more thicknesses, a connection can be made that will stand being left underground for some time. —Henry Simon, Laguna Beach, Calif.



A Tough Cement for Pipe Joints

A cement which has stood the action of 60 lb. of steam, in a pipe connection where rubber glands and white lead had failed, is made of 10 parts of fine iron filings, and 3 parts of chloride of lime, with water added to form a paste. So tough is this cement, that when two joints of 3-in. cast-iron pipe, which had been secured with it and left one night, were broken apart, the cement scaled off a portion of the iron flange of one of them. The cement is applied in the usual manner.—W. S. Standiford, Youngstown, Ohio.

Equipping Buildings with Lightning Protection

by Terrell Croft

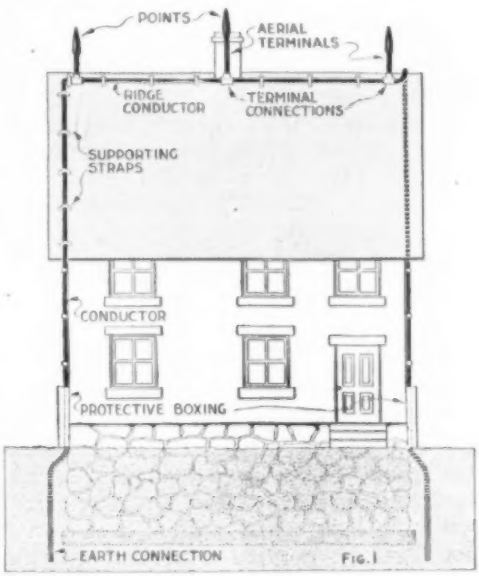
LIGHTNING destroys about $10,000,000 worth of property annually in the United States, largely on farms. The United States Bureau of Standards estimates that the yearly loss is about $8,000,000, but it is probable that this is a conservative valuation. Now, it can be shown from unbiased statistics that buildings properly and scientifically equipped with lightning protection are seldom, if ever, damaged. Reliable statistics indicate that lightning rods, even as they are ordinarily installed—and they are not always arranged most effectively—prevent at least 90 per cent of the possible lightning damage. Lightning rods, so the Bureau of Standards report asserts, reduce fire hazard from lightning as much as 99 per cent, in the case of barns. Every individual who owns, or expects to own, property, will find some practical knowledge on this subject valuable, as set forth briefly in this article.

Contrary to general impression, to install lightning rodding so that it will be most effective requires special knowledge, and experience. Any lightning rodding placed on a structure, provided one end is connected with the ground, affords some protection, but the aim is to obtain maximum protection with material purchased at reasonable expense.

Modern lightning-rod practice is largely the result of practical experience, because it is seemingly impossible to duplicate in the laboratory the actual conditions of, and the enormous electrical quantities involved in, a lightning flash. In the appliances for, and in the arrangement of, a lightning-rod installation, simplicity is desirable, and mechanical considerations are almost, if not quite, as important as the electrical features.

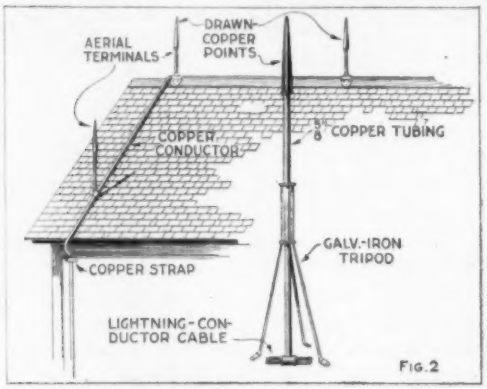
Some of the terms used are indicated graphically in Figs. 1 and 2. An aerial terminal, a point constituting the upper extremity of an aerial terminal; the conductor, usually a cable or rod interconnecting the aerial terminals and joining them with the earth connections; the earth connections, and other parts, are shown.

Whether iron or copper should be used in the conducting portions of a lightning-rod installation has been a much-debated question, and both sides are partly right. In the light of experience to date, the situation sizes up as follows: Electrically, one may be as good as the other. With either metal, there must be sufficient material



Installation of Lightning Protection on a Small Cottage, the Various Essential Features being Designated

in the lightning conductor—and in the other components of the system that may carry current at the instant of a

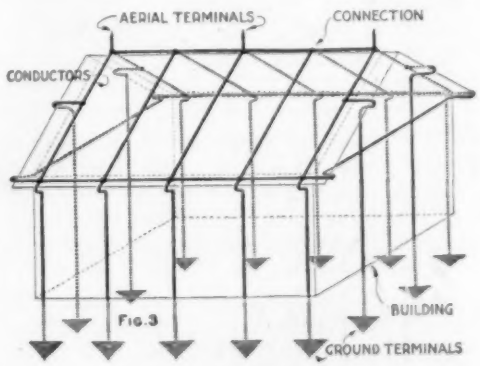


Details of a Roof Installation with Short Aerial Terminals, and a Typical Larger Aerial Terminal

flash—to insure that they will not melt. Because of the fact that iron is a poorer conductor of electricity than copper, it is necessary, from an electrical standpoint, to use a heavier conductor if it is made of iron than if it is of copper. Copper withstands the action of the weather much better than does commercial iron or steel, and has, under practically all conditions, an almost indefinite life. Commercial iron and steel have, relatively speaking, short lives. In certain instances, where iron lightning rods have been installed in dry climates, or where the air is pure, or where they have been kept painted, they have often lasted for many years. From the standpoint of temporary protection it makes little difference which metal is used for the rodding, provided there is enough of it. An iron-rod installation, correctly disposed, will afford much more effective protection while it lasts than will a copper-rod installation applied without regard to the physical facts. Furthermore, flimsy, light-weight, copper-cable conductor comprising very small diameter wires is probably not as good as a heavy-wire conductor because the frail copper is likely to be broken mechanically. It is possible that, with these conditions, the iron would last longer than the copper.

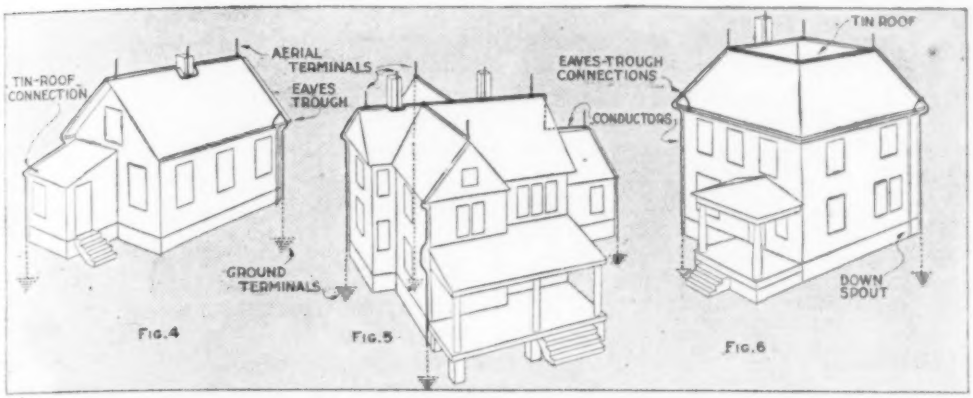
Copperplated or copper-sheathed iron lightning rods and fittings can be distinguished easily from solid copper, but unless one is familiar with the characteristics of metals, the deception may be difficult to detect by superficial inspection. Test the material by its attraction for a small permanent magnet, which will not attract any of the common metals except iron and steel. If the magnet tends to stick to the metal, which appears to be copper or brass, it is evidence that a copper or brass coating is concealing an iron core. The magnet will attract through the deceptive plated-copper, or sheet-copper sheath.

Should or should not the lightning rodding be insulated from a building is answered fairly by this fact: Only a few of the manufacturers of lightning-rod material now recommend and furnish insulators for the rodding. From a physical standpoint, it is undesirable to insulate the rodding from a building, and a great majority of the reliable lightning-rod manufacturers discontinued the use of insulators long ago. However it is probable that the diminutive insulators, as installed, are almost ineffective as insulators, particularly when they are dirty or moist. These are in certain cases the cause of inductive "side flashes," because they



An Ideal Lightning-Conductor Installation, the Structure being Completely Caged

may prevent all parts and the contents of the building from rapidly attaining the same electrical potential as that of the lightning-rod system.



Typical Installation on Various Residential Buildings, the Aim of Maximum Protection with a Minimum of Material being Carried Out Reasonably

The ideal lightning-rod installation would be a metallic cage surrounding the structure. The cage should be electrically connected to the earth and surmounted with metallic points, as shown in Fig. 3. In practice, installations are not made in this way, except where powder magazines, oil tanks, and similar structures, are to be protected. Cheaper methods provide protection which, though possibly not quite so effective, experience has shown to be adequate. The practical problem in arranging protection for a building is so to dispose the minimum amount of material that maximum protection will be afforded by it, and so that it will approximate the ideal grounded-cage arrangement of Fig. 3. Figures 4, 5, and 6 illustrate examples of typical installations.

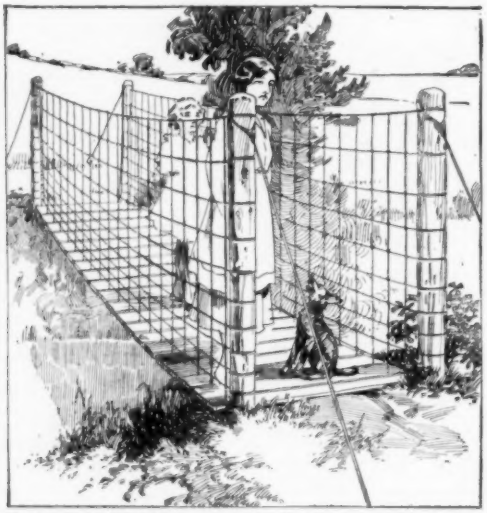
The conductor should preferably be of copper. It may be round, flat, tubular, or of star section, and solid or woven from wire strands, provided it possesses sufficient mechanical strength, and conductivity. Since stranded cable is mechanically more desirable than a tubular arrangement, it probably presents the best form of lightning conductor. There is no valid practical objection to a solid conductor, except that it is difficult to handle and to install. It must ordinarily be manufactured and shipped in relatively short lengths, which are joined on the job to form the complete conductor. Joints are undesirable, if they can be avoided. If a stranded conductor is used, no strands should be smaller than .04 in. in diameter. If the strand wires are too small, they will be mechanically weak. There is no reason to believe that "lightning travels in a spiral"; hence, twisted conductors have no advantages, on this ground, over untwisted ones.

In attaching the conductor to the building it should preferably be held thereto with clips of the same metal as that of the conductor. If dissimilar metals are permitted in contact, this may, under certain conditions, cause an electrolytic action between them, which will eat away one of the metals, at the point of their contact. Copper straps, similar to pipe straps, are ordinarily utilized for supporting round-cable conductors. Specially designed fasteners are used where the conductor is not of circular cross section. As a general proposition, the conductor should be supported at least every 5 ft. in vertical runs, and every 2½ ft. in horizontal runs. A conductor should never be supported with nails driven through it, or driven in at one side and bent over, particularly if it is of cable form. Such treatment will certainly sever some of the strands.

¶The tendency of varnish to "crawl" on the second coat, in cold weather, may be overcome by applying benzine on the first coat, permitting it to dry before applying the second coat.

A Novel Footbridge of Woven Wire

Spanning a small stream on a farm in Missouri is a novel footbridge which a farmer constructed out of woven



A Practical Bridge for a Small Stream on a Farm was Made by Supporting the Footboards on Woven-Wire Fencing

wire supported on heavy fence posts. The bridge will support a load of several persons, but is ordinarily used only for one person at a time. Strong woven-wire fencing was stretched across the stream on posts, set 3 ft. apart and strongly braced with anchored wires. Six-inch boards, 1 in. thick, were fastened on the second horizontal strand of the fencing, and the boards further supported by lacing wire around them, and attaching it at the same time to the several lower horizontal strands of wire, as a safety feature.—George M. Petersen, Buffalo, New York.

Spark Plugs Cleaned with Bag of Shot

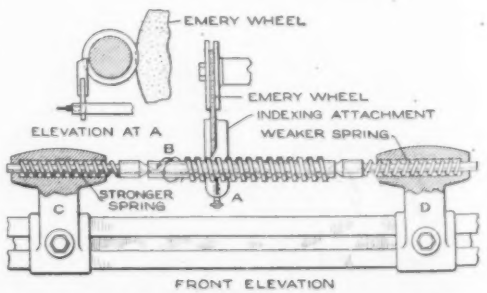
A small cloth bag filled with fine lead shot can be carried in the tool chest of an auto without trouble and is of great assistance in cleaning spark plugs. After placing a few drops of gasoline on the plug, the mouth of the bag is tied around the plug body by means of the tie strings. By taking the plug between the fingers and shaking it up and down a few moments the carbon deposit is removed. The shot does not scratch the glaze on the porcelain, or injure its insulating properties. It may be used repeatedly.—Thomas W. Benson, Philadelphia, Pa.

Rigging for Grinding Screw Threads

Grinding of hardened screws, worms, etc., such as are used in talking machines, sewing machines, and ordnance work, was done by cutting the thread, hardening the work, and straightening it on centers. This method was slow, costly, and inaccurate. The method shown is now in daily use in a large shop, and is very satisfactory.

Of the two spring centers, C and D, the tail center D has a helical spring of about one-half the strength of the spring in the headstock C, and the function of this weaker spring is to keep the centers in place, while the spring in C holds the thread against the flat spring A. These centers and springs fit accurately in the bores of the head and tailstocks, with no lateral play.

The indexing attachment is clamped to the head of the grinder, and the flat spring, at A, is set so that when a point in the thread being ground passes the emery wheel, it reaches the flat spring as soon as possible. The screw to be ground is turned by hand, and as it is turned in the direction of the arrow B, the screw is moved in the



The Emery Wheel Grinds the Threads as the Screw is Turned by Hand

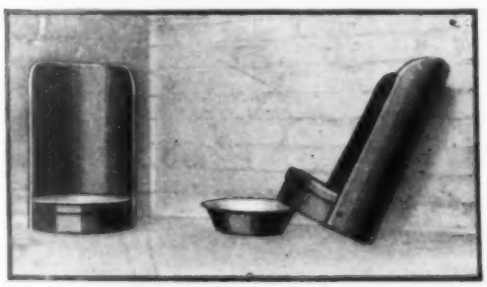
direction of the tailstock, the stronger spring in C compressing the weaker spring in D, and the cut of the emery

wheel is regulated by the flat spring at A.

This method has many applications in taper and spiral dividing-head work, and in some cases where a dividing head is useless, the work may be readily done.—J. B. Murphy, Plainfield, N. J.

Sanitary Shields for Shop Cuspidors

In a large shop, where numerous cuspidors were provided, the floors and walls around them soon became insanitary, and it was decided to provide a standard type of cuspidor and a shield that would overcome this objectionable feature. Enameled basins filled with sand were used, and a shield of sheet metal to fit over the basin was devised. One hundred of these were made cheaply and distributed about the shop. They are easily cleaned with water



Sanitation was Promoted in a Large Shop by the Use of Many Cuspidors Provided with Metal Shields

from a hose, and the results were much better from a sanitary as well as a practical standpoint.—Alfred J. Bell, Detroit, Mich.

Mystery Sailing Ship as Window Display

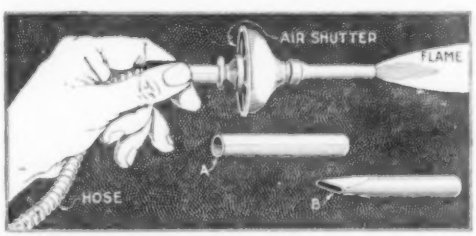
Devices which excite the curiosity of spectators are often useful as window displays, and it is on this basis that the mystery sailing ship keeps a crowd before a window in which it is displayed. A small wooden ship with sails is placed in a tank, which has rounded ends and is partly filled with water. The ship D sails around the tank A, as indicated in the diagram, because of the draft from two fans, B, hidden behind screens C. When the ship is forced to the end of the tank, the draft from the fan at that end strikes the

The Ship Sails around the Tank and the Onlookers Are Curious to Learn What Keeps It Moving

sails, shifting them, and driving the craft to the opposite end, where this process is repeated.—R. S. Matzen, Fort Collins, Colo.

Gas-Mantle Fixture Used as a Blowtorch

The portion of a gas-mantle fixture having an air shutter can easily be made into a Bunsen burner, or a blowtorch of considerable force, by flattening the round end A into the form shown at B. The fixture is attached to a gas hose, and the air shutter regulated to produce a sharp blue flame with the desired pressure. This simple arrangement is often useful where a

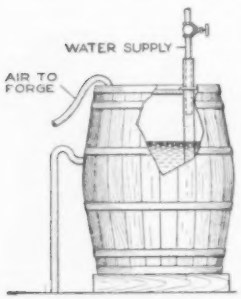


The Mantle Fixture was Quickly Converted into an Effective Bunsen Burner, with a Blowtorch Action, by Flattening the End of the Tube

Bunsen burner of the ordinary type, having a base, is not practical.—M. J. Doyle, Cleveland, Ohio.

Blast for Forge from Stream of Water

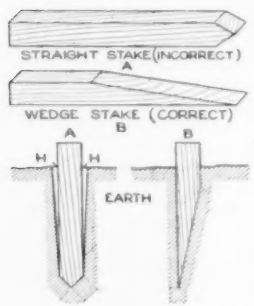
For use with a forge, where running water is available, the arrangement shown in the sketch provides a satisfactory blast at small cost. A strong barrel is made water-tight and fitted with a 1½-in. pipe through the top. The water pipe, in which a valve is set, is passed into the larger pipe, and when the water flows into the barrel, air is drawn in between the pipes, causing a compression in the upper end of the barrel. The compressed air is conducted to the forge by means of a tube. An overflow pipe provides for the excess water.—L. R. Williamson, Astoria, Ore.



Wedge-Shaped Marking Stakes Prove Superior

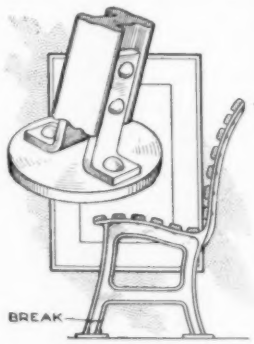
In the making of marking stakes used by surveyors, builders, and others, a wedge stake, formed as at B, is preferable to one of the straight type, shown at A. The wedge stake is more difficult of withdrawal, and is more likely to remain at the point where it was driven into the earth, a feature of considerable importance because much time and money may be sacrificed when stakes must be relocated. When a straight stake is driven, the hole which it makes in the earth is larger, as shown at H, at the surface of the earth, than it is at the lower end of the stake, and there is not much adhesion between the stick and the soil.

If the stake is cut to form a long wedge, as shown at B, then all of the surface of the two sides will be in firm contact with the earth, and the resistance to withdrawal will be increased. To determine the relative advantages of the two types, 100 straight stakes were driven in a certain job, and also 100 wedge stakes, under identical conditions. Thirteen of the straight stakes, and only three of the wedge stakes, were lost.



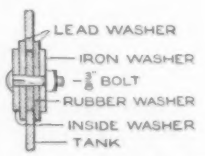
Replacing Broken Foot on Iron Lawn Bench

A bench with metal supports, in a school playground, was broken as indicated, and the foot part was lost. A neat repair was effected by students in the machine shop. Two pieces of ¼ by 1-in. strap iron were riveted to the broken end, and to these strips a rounded piece of ½-in. iron was riveted as a fastening plate, like those on the other legs.—A. L. Braun, New York, N. Y.



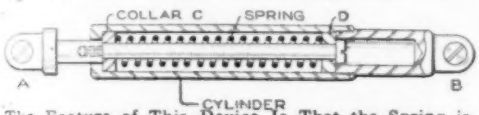
Repairing a Hole in a Small Water Tank

A special outlet in a kitchen-range boiler was no longer needed, and, since the locknuts in it were rusted badly, it was necessary to plug the hole by other means. A rubber disk was fitted closely into the hole, and ⅛-in. lead washers were placed on each side of it. Iron washers were slipped over these and the entire set was bolted together very firmly, with a ⅜-in. bolt. The lead washers were forced into the opening, compressing the rubber, and forming a tight packing.—Fred W. Page, Winfield, Kans.



Compression Coil Spring with Double-Action Case

An arrangement of a coil spring in a case so that the spring will be compressed both when the points of fastening, A and B, are brought farther apart and closer together is useful on doors and on many mechanical devices. A typical housing of a coil spring in a case, such as would be suitable for a door, is shown in the illustration, which is a longitudinal sectional view. When the points A and B are brought closer together, the collar C acts on the spring, compressing it against the collar D, and the bolt head slides in its pocket. When they are brought farther apart, the collar D compresses the

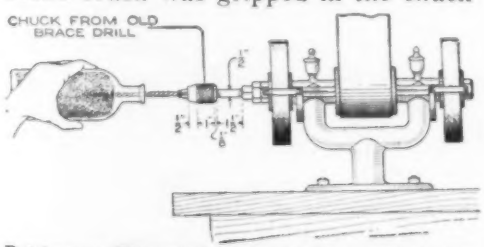


The Feature of This Device Is That the Spring is Compressed When the Distance between the Points of Fastening is Extended or Shortened

spring against the collar C, bearing on the end of the cylinder.—George M. McGinley, Woonsocket, R. I.

Chuck on Emery Grinder Used for Washing Bottles

In a shop and laboratory, an emery grinder was rigged to provide a handy power bottle-washing machine, by mounting a chuck from an old drill on one end of the grinder spindle. The chuck was set on a ½-in. rod, and this was threaded into the spindle. The bottle brush was gripped in the chuck

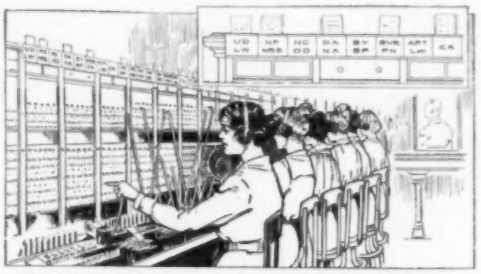


Bottles were Washed Quickly and Thoroughly by the Use of This Improvised Washing Machine Attached to the Emery Grinder

and the bottles slipped over it, and held in the hand as shown.—P. F. Jamison, Chicago, Ill.

Pockets on Switchboards for Memos of Special Calls

The traffic manager of a telephone exchange handling a large number of



Telephone Service was Improved by Providing a Code File for Delayed Toll Calls

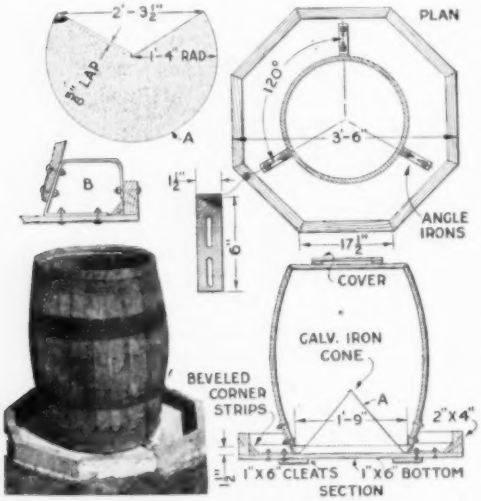
long-distance messages found that his operators lost considerable time in keeping track of their ticket records of toll calls that could not be completed immediately. To keep the "delayed" tickets constantly before the operators, pockets were constructed along the top face of the switchboard, each pocket marked with the code letters showing the reason for the delay in handling the message, as UDLW: "Party called for is out; left word for him to call." The pockets were made of light tin, painted dull black, and lettered in white. The scheme is very successful in speeding up the service, keeping delayed call tickets in sight of both the operators and the chief operator in charge.—E. C. Blomeyer, Waco, Tex.

Soldering Wrought-Iron Rings by Dipping Saves Time

Certain kinds of machinery require the use of wrought-iron rings, made of cylindrical bar iron of small diameter. It is common practice to solder together the ends of these rings by the use of a soldering iron. When a large quantity of these rings were made at one time, it was found more economical to substitute a dipping process. After the ring is formed, the ends are dipped into a pan of molten solder. This method reduced the soldering time 50 per cent.—Joseph Plogmann, Cincinnati, Ohio.

A Swine Cafeteria in a Barrel

To make this "help yourself" eating house for swine, which was built at the Minnesota Agricultural College at a



The Construction Is Simple, and the Barrel can be Adjusted Quickly to Increase the Quantity Fed

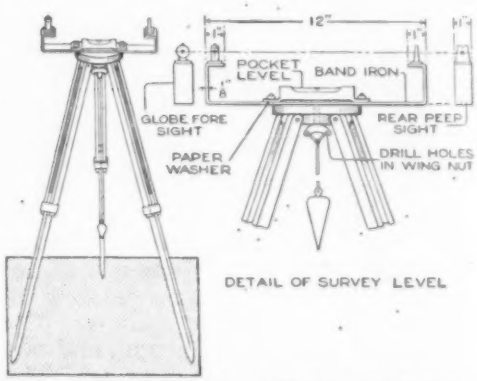
cost of $6.50, including labor, obtain an empty barrel, some boards, nails, a piece of sheet iron, and some strap-iron angles. The barrel is supported slightly above the platform, and the grain, or tankage, feeds out around the lower end, from the sheet-iron cone A. Angle irons, as detailed, keep the barrel in position. Two slots permit

Twelve Shoats or Six Full-Grown Hogs are Accommodated by This Self-Feeder

the supports to be slipped out far enough to clear the bolts in the barrel, for easy adjustment of the latter. The trough and platform are made of 1-in. lumber, and the rim is of 2 by 4-in. pieces. Guards may be attached to keep the pigs from rooting out the feed, as detailed at B. This outfit accommodates 12 shoats or six full-grown animals, at a time. The barrel feeder is cheap and simple in construction, and its durability is limited only by the material used for the trough.—E. R. McIntyre, Madison, Wis.

Builder's Survey Level with Sights from Old Rifle

This homemade arrangement provides a means of ascertaining true levels on buildings, floors, stone foundations, etc., and is made of materials easily obtainable. Make a tripod, using the top plate and the attaching wing nut from an old camera, if possible. Band iron is bent, as shown, and on the top arms an old



A Serviceable Survey Level, Made at Small Cost, Which Gives Accurate Results

pair of rifle sights are soldered in place, taking care to get them very accurate. Fix a pocket glass level, about 4 in. long, on the direct center of the iron bracket, by the use of two ordinary carpenter's squares. The level in its level position must be absolutely parallel with a line through the peep-sight centers. Insert small paper washers under the pocket-level clamps, and after the sights are soldered to the top ends of the bracket, it will be easy to obtain an accurate parallel. Three

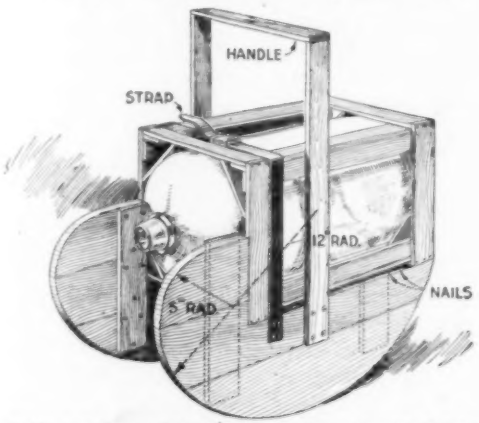
holes are drilled in the iron level bracket, the center one tapped for the camera-tripod thumbscrew, by which the tripod is fastened to the level bracket. The other holes are for securing the pocket level. Old rifle sights are easily obtainable at a locksmith's shop. The plumb bob is suspended as shown.

A Wire-Gauze Stencil

A good background stencil can be made by attaching letters and figures to wire gauze, the color being applied over the lettering, producing a background of the desired color. This stencil is flexible, making it useful on irregular surfaces.

A Tipping Cradle for Carboys

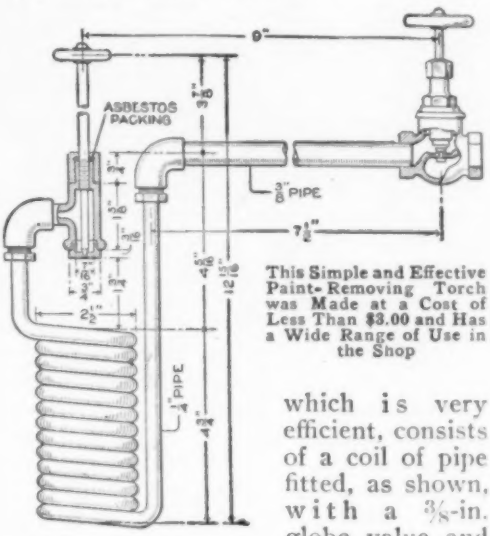
Large bottles or carboys cannot be handled safely while pouring out the contents by tipping, because of their weight and shape. The arrangement shown is built of wood, and makes the handling of carboys safe and convenient. The carboy is placed on the two rockers; the frame of the carboy is gripped by small nails, which protrude ¼ in. from the upper edges of the rockers. A strip nailed to the sides of the rockers holds the carboy from slipping from the cradle. The handle gives a good hold in tipping the device.—John E. Cahill, Jr., New York, N. Y.



Acids and Other Liquids may be Poured with Safety by the Use of This Carboy Rocker

Torch for Burning Off Old Paint

A device for burning old paint, or enamel, from automobiles, carriages, passenger cars, locomotive cabs, etc., which is very efficient, consists of a coil of pipe fitted, as shown, with a ⅜-in. globe valve and other parts. Gas can be used with it, or a reservoir filled with oil and connected by hose to an air line, which forces the oil out through another hose connected to the ⅜-in. globe valve, can be utilized. The globe valve regulates mainly the flow of the oil, and the needle valve controls the size of the flame.



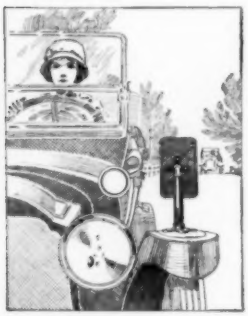
This Simple and Effective Paint-Removing Torch was Made at a Cost of Less Than $3.00 and Has a Wide Range of Use in the Shop

The user holds the device in one hand, and goes over the painted surface, keeping the torch moving slowly, and then holding the burner away, while he removes the burnt paint with a scraper held in the other hand. In using oil, the coil serves a twofold purpose, helping confine the flame to a proper area, and the flame passing inside the coil heats the oil being forced through it to a high temperature by the time it gets to the burner, thus preparing it for combustion.—Joseph K. Long, Renovo, Pa.

¶Concrete that collects on a mixing machine can be removed easily if a heavy coat of grease is applied to the surfaces where the concrete collects before the mixer is put into operation.

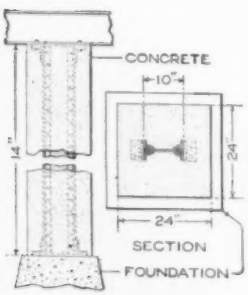
Safety Mirror Attached to Automobile Mudguard

A novel way of mounting traffic mirrors on automobiles, instead of the usual position at the side of the windshield, is on the mudguard of the front wheel, facing the driver, using only ordinary pipe fittings. A crowfoot, or flange, is attached to the back of the mirror, into which is fastened an ell and straight piece of ¼-in. pipe, long enough to extend a few inches below the mirror. A crowfoot is also fastened to the mudguard. The mirror frame and fittings are painted the same color as the car. A better view of what is going on back of the machine is obtained by the mirror in this position.—Harry Slosower, Pittsburgh, Pa.



Old Steel Columns Reinforced by Concrete Casing

Structural-steel columns, that are rusted to such an extent that further painting is both inadvisable and ineffective, may be kept in a good state of preservation and be strengthened as well by incasing them in concrete, as shown. This system is applicable to many types of columns, and if the concrete is carried to the top, it really becomes a reinforced-concrete column, the steel furnishing the reinforcing for the concrete. Such work has the further advantage of being possible to construct without removing the column from the load it is supporting.—H. P. Roy, Kansas City, Mo.

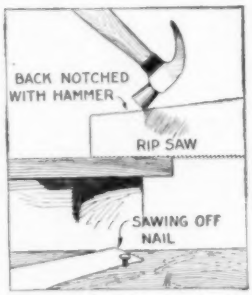


White Opal Glass Useful for Headlights

An excellent headlight lens that eliminates the glare, gives an ample amount of light when the lights are dimmed, causes no perceptible loss of light on the road in front, while giving more light on the sides of the road and being easy to keep clean, can be provided by using panes of white opal glass cut to the required size. It costs a little more than paper dimmers, but much less than patented lenses. This glass gives a pleasing cream-colored light.—Horace M. Fulton, Washington, D. C.

Ripsaw Cuts Large Nail without Injury

A nail-cutting trick which has many practical uses, and which will interest users of handsaws, is performed as follows: The performer announces that he will cut off a tenpenny nail with a ripsaw without injuring the saw. He then notches the back edge of the saw with a hammer, as shown, and, driving the nail into the bench or into a block, cuts it off squarely with the notched edge. This will not deface the saw if the notches are made small, and even adds to the tool's usefulness.—E. Ward, Detroit, Mich.



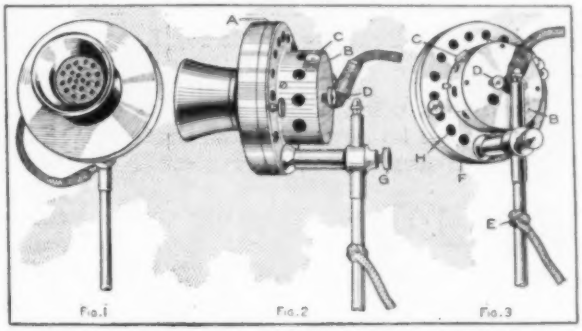
Pipe Cutter Marks Round Stock for Sawing

Careful work is necessary to saw off round stock with a square end, and the sharp edge resulting is undesirable in many instances. By marking a V-groove in the round bar at the line where it is to be sawed off, a guide is provided for the sawing, and the edge is neatly beveled off, when the cut is finished. Use a pipe cutter for the groove.

A Heavy-Current Radio Transmitter

By EARL C. HANSON and ALBERT MARPLE

A TRANSMITTER that has withstood heavy and constant service, proving its reliability, is shown in the sketches drawn from photographs. A front view of the transmitter is shown in Fig 1. The face is 4 in. in diameter. The side elevation, Fig. 2, shows clearly the front chamber A, at the back of which is an insulated slate cup, B, which contains a teaspoonful of carbon grains. These grains are larger than those used in the ordinary transmitter, and do not burn so readily. The rear of the chamber is of fiber insulation, used to conduct the electrodes into the cup containing the carbon grains. The latter may be purchased from stores handling telephone supplies.

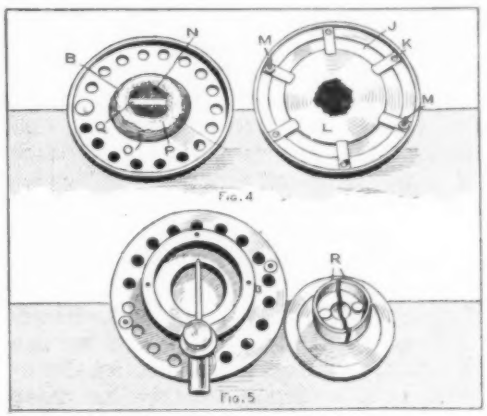


Assembly Views of the Transmitter, Showing the Mouthpiece, the Housing, and the Connections

This fibre piece B is shown as viewed from the back in Fig. 3. The two setscrews C, at the circumference, hold the electrodes D, shown in the center of the fiber plate, from moving in or out after being once adjusted. One wire of the aerial circuit is connected to these electrodes, the other being fastened to the metal standard E, supporting the transmitter F in various positions. The transmitter is held firm by means of setscrew G. The front half is fastened to the back by two setscrews, near the circumference of the 4-in. diameter piece, and holes, H, are drilled for air circulation, to keep the inner chamber cool.

At the right, in Fig. 4, is shown an inner view of the front half of the transmitter. A ring of thin mica, J, crossed by the ends of the six radial clamps K, holds in place the carbon diaphragm L, at the center. The clamps serve, also, to hold the tension of the diaphragm constant. The two longer threaded screws M are those used in holding together the front and back of the transmitter. At the left is shown the back half, with the inner chamber containing the carbon grains N. The main chamber of slate O, formed by the raised edge around the back half, is shown, and a ring of soft asbestos, P, may also be seen. This keeps the carbon grains from packing under the slate cup and the diaphragm. Across the center of the cup is a thick strip of mica, Q. This is not essential, having been used in experimenting with the carbon grains divided on either side of it.

Figure 5 shows the inner construction of the back portion of the slate chamber, and the electrodes which conduct the current into the cups holding the carbon grains. At the ends of the electrodes are semicircular pieces, R, of ordinary hard carbon. One of the novel features of this transmitter is that the chamber holding the carbon

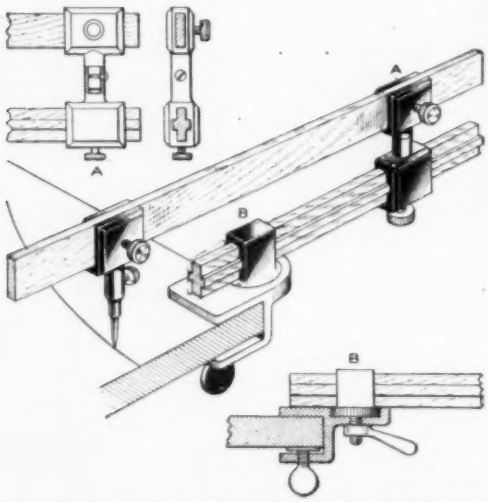


Interior Views Showing the Detail of Construction, the Slate Chamber Being at the Right in Fig. 5

grains may be increased in size by simply loosening the setscrews C, Fig. 2, which hold the electrodes in place, and drawing them outward, leaving room in the chamber for more grains. Also, this feature assists in making the initial adjustments, while the transmitter is being first tested out. The mouthpiece of this transmitter is similar to those found on like instruments.

Extension to Drafting Table for Long Radii

Draftsmen often find it necessary to draw arcs of so large a radius that the beam compass cannot be centered on



The Drafting-Board Extension is Clamped to the Edge of the Board or Table, and the Necessary Adjustments Made by Sliding the Members A along the Supporting Beams

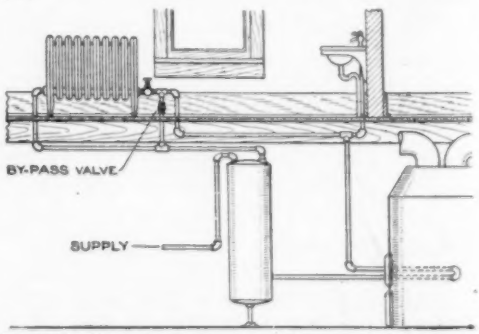
the drafting table. Various makeshifts are devised, but are more or less unsatisfactory. In an office where much of this work was done, the device shown in the sketch was made out of parts of an old beam compass, and a special clamp made from an old vise casting. This arrangement gave a very substantial job, but simpler devices for the same purpose, and for use in locating centers in perspective drawings, can be made quickly by most draftsmen. In the arrangement shown, the parts A were made from fittings of a beam compass, and a long arm was provided. Because of the shape of the opening in the casting B, the supporting arm was made to conform to it, and proved very substantial.—Gus Hansen, Peachland, B. C., Canada.

Safety Pins Replace Small Cotter Pins to Advantage

On automobile engine parts, such as accelerator control-rod connections, which often must be disjoined, and in other light machinery, where ordinary cotter pins are used, they cannot be removed handily and, in the small sizes, bend under a twisting strain. Strong safety pins proved serviceable substitutes, and had greater tortional resistance than any cotter pins for the same size of hole. They stay on, and can be taken out and put in easily.—Horatio N. Holton, Chicago, Ill.

Hot-Water Supply and Radiator Heat from Hot-Air Furnace

The sketch shows how an installation was made by which hot water was supplied at a faucet, and a radiator was heated, in a cold part of the house, from the hot-air furnace. Most furnaces of this type have an opening beside the fire door for a heater coil. Two lengths of ¾-in. pipe, joined with a return fitting, were used at the furnace, and the pipes connected as shown. The radi-

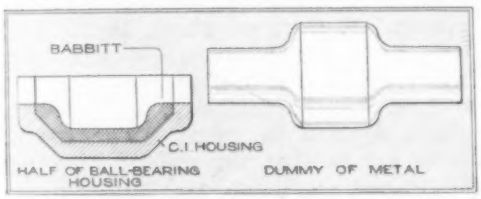


By Adjusting the Radiator and By-Pass Valves the Circulation may be Limited to the Faucet Connections

ator may be shut off without disturbing the circulation to the faucet by means of the by-pass valve.—J. J. O'Brien, Buffalo, N. Y.

Babbitting Mountings for Ball Bearings

When a ball bearing is used in assembling machines, the housing, or mounting, should be finished to close dimensions. This work is expensive. A quicker and cheaper method is to make a dummy of iron, exactly the same size and shape as the inside of the housing. It should be polished, so that no babbitt can stick to it, as shown. The mountings are made in halves. When ready for pouring the babbitt, the dummy is put in one of the halves of the housing so that the shafts of the dummy are resting on the proper bearings in the housing. In order to prevent the hot babbitt from running out at the ends, fire clay, or whiting mixed with asbestos fiber, is used to seal up the ends. The dummy



Housings for Ball Bearings can be made Quickly by the Use of a Metal Dummy

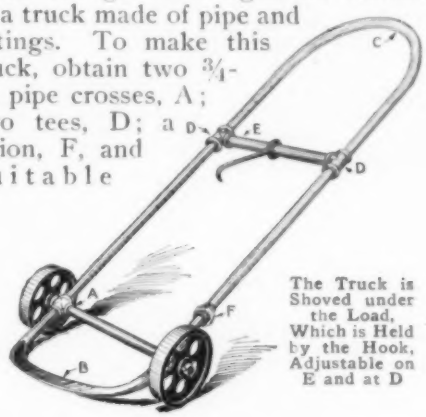
is removed when the babbitt has cooled, and the other half of the housing is babbitted similarly.—Joseph Limbrunner, Shelton, Conn.

Wire Protective Screen Increases Usefulness of Vacuum Cleaner

In the cleaning of trays containing small screws, and similar fittings used in shops, it is inconvenient to remove the articles in order to get at the dirt. Especially when the parts are small, such as metal type, the use of a powerful vacuum cleaner is not practical, and blowing out of the dust is not satisfactory. By covering the trays, or other places to be cleaned, with wire screening, and rattling the contents, the dust may be effectively and quickly removed with a vacuum cleaner.—John Robinson, Hillsdale, Mich.

Barrel Truck Made of Pipe and Fittings

Adjustability to various sizes of loads and great strength are features of a truck made of pipe and fittings. To make this truck, obtain two ¾-in. pipe crosses, A; two tees, D; a union, F, and suitable

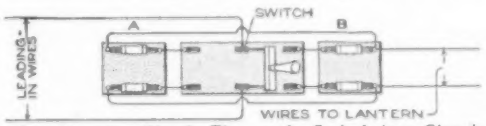


The Truck is Shoved under the Load, Which is Held by the Hook, Adjustable on E and at D

lengths of ¾-in. pipe for the other parts. Bend a section of pipe, 26 in. long, as shown at B, so that the "U" is 18 in. wide. Thread each of the ends and flatten the central portion at B. Join the crosses on this piece, as shown. Thread and shape the piece C, which is 5½ ft. long, to the same width. Slide the tees D, fixed to the pipe E, on pipe C, setting the hook in place. The latter is made of ⅜-in. round iron, to slide on pipe E. The hook and the bar and tees D may be moved as desired. Fit the union and a suitable nipple at F. Run an axle through the crosses A, and put on the wheels. To use the truck, run end B under the barrel, or crate, and place the hook over the top, holding the load securely.—S. N. Miller, Denver, Colo.

Emergency Fuse Circuit for Motion-Picture Lanterns

To save time in exchanging fuses in a motion-picture-show lantern room, I devised the plan of wiring shown in

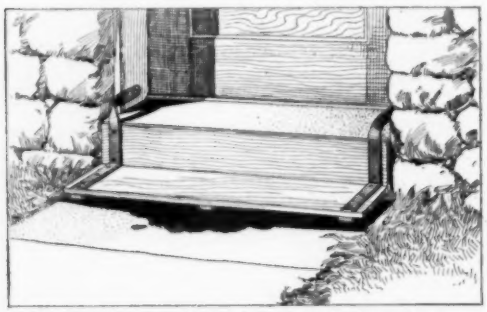


The Operator Simply Throws the Switch into Circuit with the Extra Fuse Block, If the First Set Blows Out

the diagram, consisting simply of a double-throw knife switch connected with two fuse blocks, so as to throw either of them into use at will. Thus, if a fuse burns out, it is only necessary to throw the switch over, and go ahead with a new set of fuses, while the burnt-out one may be replaced at leisure.—Fred Kuhlmann, Peru, Neb.

Hinged Tread Covers Puddle at Worn Doorstep

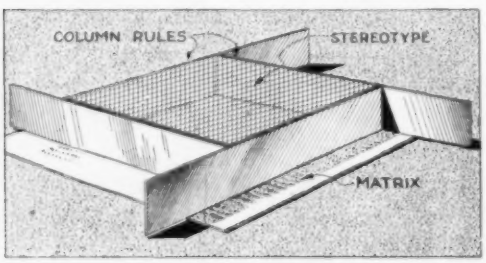
Often it is desirable to lay a board over a spot where water is apt to lodge just outside the doorstep. An improvement on this method is shown in the sketch, being a riser and a tread hinged, by means of two bent iron straps, to the door frame. The hinges hold the step in place and permit its being raised when sweeping.—Albert O'Brien, Buffalo, N. Y.



The Wooden Tread Bridges a Worn Place in the Doorstep, Where Puddles Form

Stereotyping without Special Apparatus

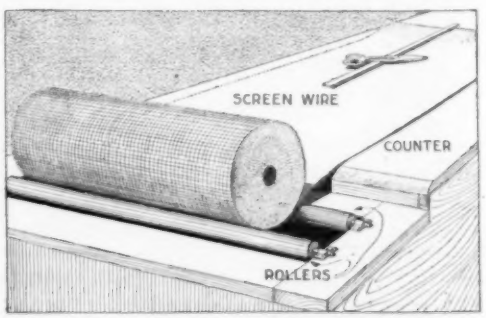
Frequently it happens, in small newspaper or printing offices not provided with stereotyping equipment, that some advertiser wants a cut made from a paper matrix, and it can be done with very little trouble, as follows: The mat is warmed, and laid on a previously warmed stone, or other flat surface. A dam of column rule is built around it, and held in position by weights against the outside. The dam is filled with metal, and, after cooling, the casting is cut down to size, and made type-high by pasting paper or Bristol board to the bottom of the cut. —J. S. Hagans, Toledo, O.



By This Method Small Cuts can be Cast from a Matrix with No Special Apparatus

Device for Unrolling and Measuring Wire Mesh Handily

Screen wire, when being unwound, has a tendency to roll toward the part that is being unwound, and will not remain still. To remedy this, a hardware man made an arrangement as shown. A counter, about 12 ft. long, was used, on which to unwind the wire. On one end of the counter, two rollers, 2 in. in diameter, were placed, about 4 or 5 in. apart. The rollers were set so that the roll of wire can be placed on them, and then be unwound. The weight of the wire holds it on the two rollers. Rolls of screen wire can be kept handily under the counter on special shelves.—Lee M. Delzell, Maroa, Ill.



The Awkward Handling of Screen Wire in Rolls is Overcome by This Arrangement

¶By slitting the point of a pen-filling quill on an ink-bottle stopper and bending it into a cuplike form, ink can be transferred to the ruling pen more handily.

A Folding Cabinet for Drafting Equipment

Provision is made for the storage of a great variety of drawing equipment —instruments, pens, brushes, inks, etc. —in small space, by the cabinet described, and the contents are readily accessible when needed, or in use. It can be placed on a stand or drafting table, but a better arrangement is to mount it on a swinging wall bracket, of such radius that the contents can be swung to the most convenient position. When not in use, the materials are packed into their places, and the cabinet closed up and swung out of the way. No dimensions are given, as these will be governed by the equipment to be housed, and the space accommodations.

The outfit, as shown, consists of three trays and an outer case, the upper and lower trays C and A being movable, while the center tray B is stationary. The various kinds of materials and tools suitable for the compartments are suggested in the photograph. The construction and operation of the trays are shown in the sectional view. When the case is closed the compartment C slides back into its original place. The compartment A folds down as indicated by the dotted line, and the cover D folds forward to its dotted position. The brace E, which is held in place by the clip F when supporting the raised tray A, is released and folds into the cover section D, when the

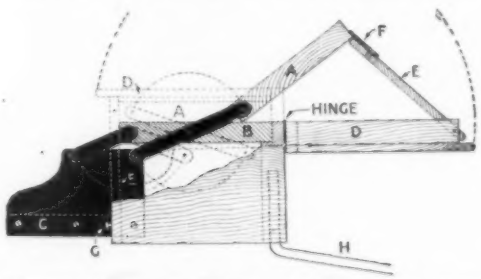


Diagram showing the Method of Folding the Various Sections into the Cabinet

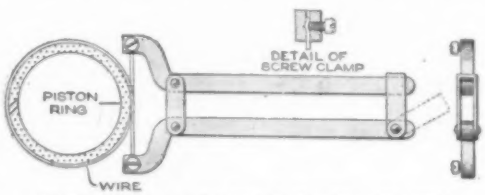
cover is closed. The compartment C is locked into place by a metal strip engaging the round-head screw G, and the arm H is set into a hole bored in a block, glued in one corner of the lower

When the Cabinet is Folded Open, the Drafting Equipment is Compactly Arranged, Yet Easily Accessible

section.—T. T. Sturgeon, Los Angeles, California.

Tool for Fitting Piston Rings

When assembling the pistons and cylinders of gasoline motors, trouble is usually experienced in inserting the



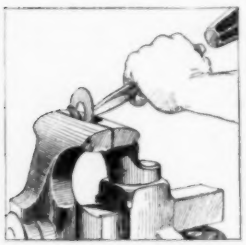
Piston Rings can be Fitted Handily with This Homemade Tool

piston rings. An effective tool for this purpose is shown in the sketch. A piece of music wire, 1/16 in. in diameter, is given a turn around the piston ring, and the two ends are fastened in the proper ends of the levers, as shown, by means of the clamping screws, with the handles wide apart. When the handles are brought together and clamped in the loop, the wire is tightened up and the piston ring compressed, so that it will readily enter the cylinder. The tool can be made to suit the pistons, and should be made of 1/16 by 5/8-in. strap iron, and about 9 in. long over all.—W. B. Burr, Boston, Mass.

¶A good working surface is provided on a drafting table by covering it with smooth, heavy paper.

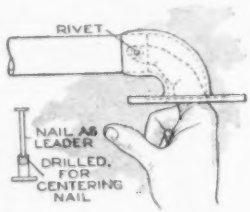
Cutting Thin Metal Washers by Hand

When washers are needed, heavy metal or tools with which to make them are sometimes not at hand. Washers made of thinner metal may be substituted, several being used to build up the proper thickness. An easy method of cutting these is to mark them on the sheet metal, trim them off on the outside, and cut the centers out with a cold chisel. Turn the washer as the cut progresses, guiding the chisel on the vise.—Hugo Kretschmar, West Nyack, N. Y.



Setting a Rivet Handily in an Awkward Place

To get a rivet into an awkward hole so that it can be riveted from the outside, put soft laundry soap on the end of the finger, press the rivet in firmly, and put the finger at the rivet hole. With the other hand, put the nail in as a leader, and work the rivet into the hole. A small countersunk hole in the end of the rivet makes it easy for the nail to engage the rivet.—Arthur F. Stern, Milwaukee, Wis.

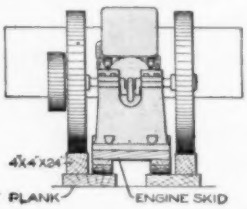


Measuring the Velocity of a Stream

To measure the velocity of a stream, step off or measure 120 ft. along the bank, where a straight course may be found. Throw several floats—tightly corked bottles will do—into midstream, and time them over the 120-ft. course. The average time of all floats divided into 100 is the average rate per minute. Water flows faster at the top of the stream than at the bottom and sides; the ratio of 100 to 120 is about the proper one to correct for this fact, giving the average velocity at a given cross section. By using the 120-ft. course, the calculation is simplified.—R. Z. Kirkpatrick, Washington, D. C.

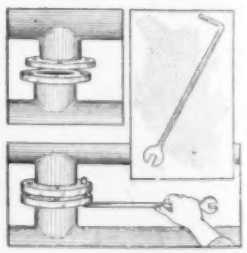
Gas Engine Transported by Rolling It on Flywheels

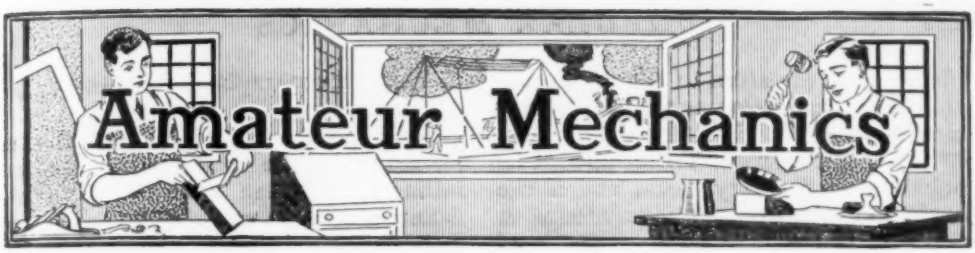
To obtain the maximum hours of daily service from a gas engine, I was obliged to move it from place to place. By using squared pieces of timber under the flywheels on which to roll the engine on the wheels, this work was made easy for one man. By turning the wheels the engine can be moved readily considerable distances, the timber being moved forward as required. The water tank should be empty. Timbers 4 ft. long are handiest, especially in turning corners. Unless in a dusty place, it is well to open the compression-relief cock when moving the engine in this way.—J. E. McCormack, Haliburton, Ont., Can.



Handy Wrench with Drift-Pin Handle

When erecting or installing machinery where cast-iron flanges, with bolts, connect the parts, it is often necessary to draw one of the flanges into place, to get the bolt holes to match. When there is not sufficient clearance to use a mandrel or drift pin, a rod bent to a short right angle is handy. An angle of this kind forged on the handle of a wrench, as shown, combines two useful tools, and has proved quite popular, as indicated by frequent borrowing of it.



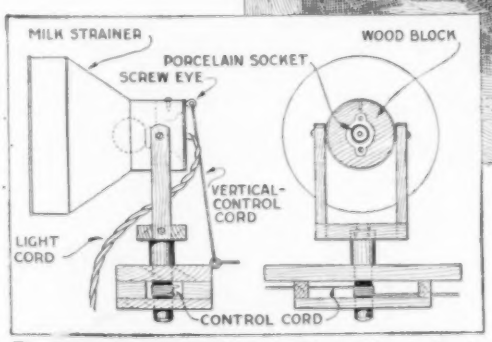


Pivoted Searchlight Made of an Old Milk Strainer

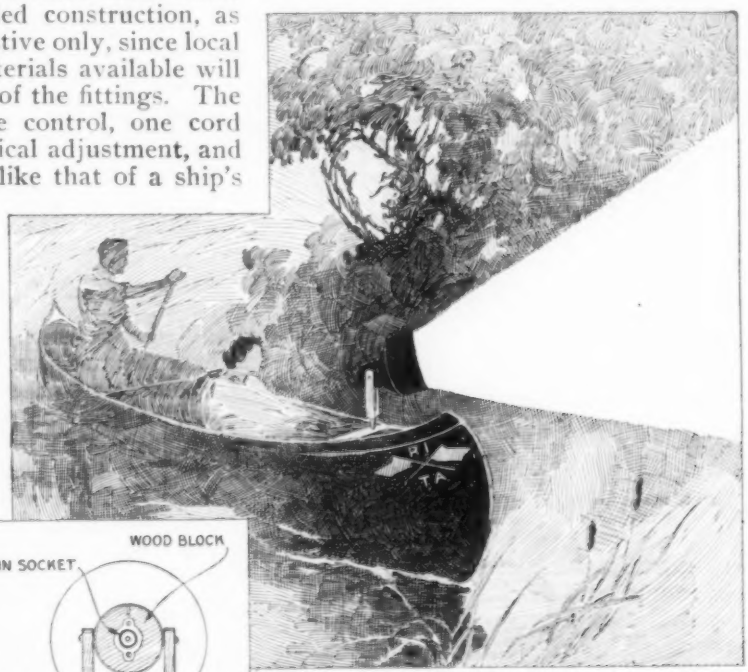
By JOHN J. SPAULDING

BOTH as a safety device and a practical novelty, a homemade searchlight for a canoe, or other small craft, is worth while making. An old milk strainer was used for the reflector of that shown, and many equally serviceable makeshifts can be devised easily from old cans, or formed from sheet metal. The detailed construction, as indicated, is suggestive only, since local conditions and materials available will govern the design of the fittings. The light has a double control, one cord governing the vertical adjustment, and another, arranged like that of a ship's wheel, the horizontal pivotal range. The vertical adjustment is desirable, but not essential. The control cords are run in screw eyes along the coaming of the craft, so that one person can paddle the canoe, and adjust the searchlight as well. Dry cells, stored under the bow deck, or in a box set at some other convenient place, supply the current for the 6-volt lamp.

The main dimensions of the fittings, as detailed, are: strainer, 10 in. in diameter and 10 in. long; vertical support, 12½ in. over all, and 6 in. wide at the upper portion; the wood used is ½ and ¾ in. thick, except that for the pivot post, which is 1 in. thick. The reflector is fitted with a wooden block through which the porcelain socket is set, as shown. A knife switch,



The Support for the Reflector is Pivoted in the Deck, Reinforced as Indicated



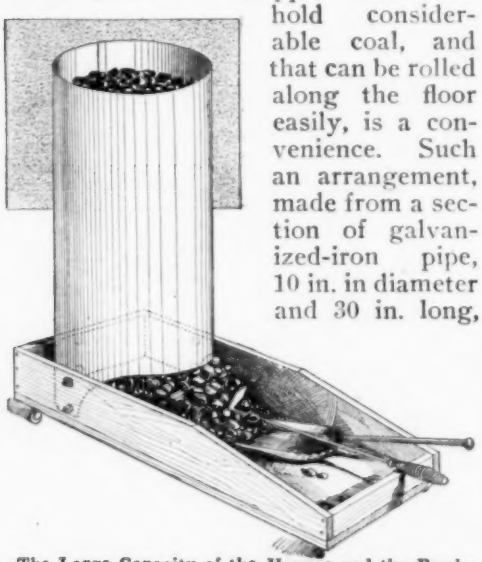
Canoeing and Boating at Night Is Safer and More Pleasurable if the Craft is Equipped with a Searchlight. This One was Made of Pick-Up Materials at Small Cost

placed near the stern of the craft, controls the connection with the battery circuit.

The inside of the reflector should be polished with emery cloth, and if the surface is rough, it may be painted with white enamel. The outer surfaces of the metal part are painted black. The wooden parts may be painted, or given several coats of spar varnish, to withstand the weather.

Gravity-Feed Coal Hopper on Truck

In the large farm kitchen, in the workshop, and even for firing a small furnace, a coal hopper that will hold considerable coal, and that can be rolled along the floor easily, is a convenience. Such an arrangement, made from a section of galvanized-iron pipe, 10 in. in diameter and 30 in. long, is shown in the sketch. The pipe was cut at one end, as shown, so that when the coal was poured into the hopper, it would feed out. A truck, mounted on casters, was made, 12 in. wide, 5 in. high, and 25 in. long. The hopper was mounted on one end of it, and bolted securely at the sides and end. The coal is shoveled into the hopper at the bin, and the load pushed to the furnace, where it can be easily used as needed. The construction can be made larger for use with a coal scoop, in firing a boiler or large furnace.—L. R. Markwood, Factoryville, Pa.



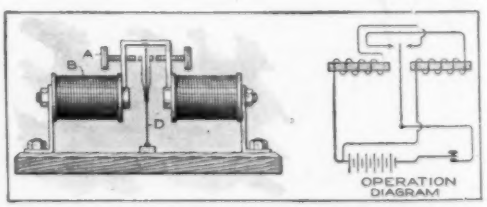
The Large Capacity of the Hopper and the Ready Portability of This Arrangement Are Practical Features

Taking Photographs in Falling Snow

Falling snowflakes in a camera photograph—the large feathery, slow-falling kind—often make an exquisitely beautiful picture out of a commonplace scene. And while the great majority of the attempts to get them prove failures, the photographer—usually an amateur—needs only to provide an avenue in front of his lens a short distance, that is free from falling flakes, by the use of a shelter such as a tree or porch. The slow snapshot necessary in cloudy weather will not stop the motion of the flakes nearest the camera, and these passing through greater angles of space in equal length of time than those farther away, will blur on the negative. We made some excellent outdoor views in deep snow, while heavy snow was falling, with flakes splendidly decorating the darker regions of figures and foliage, by holding a felt hat and two umbrellas in a line in front of the camera, and above the range of the lens.—J. Cecil Alter, Cheyenne, Wyo.

A Double-Contact Vibrator

A double-contact vibrator, which eliminates sticking contacts, spring troubles, and other sources of annoyance, in addition to producing a fine, high tone, is shown in the sketch. It is an instrument easy to construct, by reason of its simplicity. Special care in making the vibrator D will insure good vibration. The springs, holding the contacts, are of phosphor bronze. The contacts may be made of silver, platinum, or other metals, which will not burn and break contact. The coils

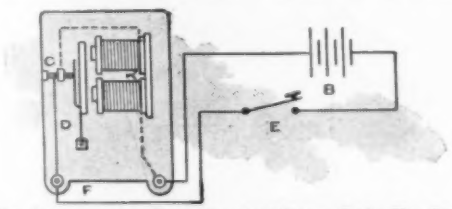


When the Vibrator Touches One Contact, the Coil on the Opposite Side Attracts the Vibrator, This Process being Repeated Alternately

B are of the common bell-ringing type. The springs on the vibrator should not be too long, nor too weak; experimenting will determine the length at which they will work best. The adjustment is made at the thumbscrews A. The coils are supported on metal brackets, bolted to a wooden base. The method of hooking up the vibrator in the key circuit is shown in the diagram.—J. L. Taylor, Barker, N. Y.

Battery Buzzer Converted into a Telegraph Sounder

An ordinary battery buzzer may readily be converted into a telegraph sounder for use in practicing the Morse code. All that is necessary is to connect the vibrator contact C of the buzzer to the binding post that is not insulated from the frame. The other connections of the key and battery are the same as in any ordinary telegraph or buzzer circuit. In the diagram, C represents the vibrator contact; D, the wire connecting the contact and the

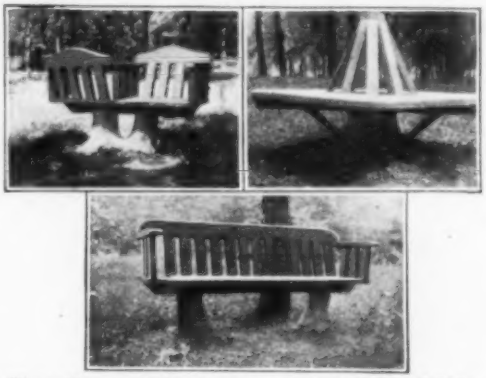


The Amateur can Practice the Morse Code Handily on This Sounder, Made from a Buzzer

uninsulated binding post, and F, the uninsulated binding post; E is the telegraph key, and B, the dry cells.—Clarence F. Kramer, Lebanon, Ind.

Lawn Seats Built on Tree Stumps

A practical use to which stumps, left from the felling of trees, are put in a city park is as supports for lawn benches. This obviates the need of grubbing them out, while the work of preparing them to receive the seats is less than would be required to remove the stumps. Of course, the location of the stump will determine whether it is worth while as a support for a seat, or had better be grubbed out. Many designs are possible, and the position and size of the stumps available will suggest suitable construction. The

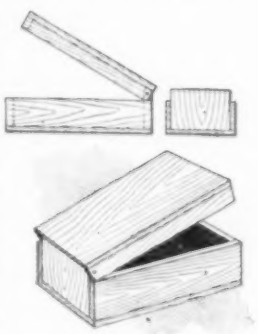


These Practical Lawn Seats Show the Possibilities of Stumps as Supports for This Purpose. The Conversation-Chair Design Is Especially Interesting

woodwork for the seats is simple, and the benches can be made removable for the winter if desired.—C. L. Meller, Fargo, N. D.

A Hinged Box Cover Made without Hinges

When a wooden box with a hinged cover is desired, especially a small one, hinges are not always at hand, and are sometimes difficult to obtain. Under these circumstances a good substitute is to make the box as shown in the sketch, using the extension of one end and nails, or screws, driven through the back corners of the lid, as a hinge arrangement. This makes the use of hinges unnecessary, and is serviceable even for permanent use. Where hinges projecting from the surface of the box are objectionable, this method of construction is especially desirable. It is best to make the hinged ends with the grain vertical, and to round off the hinged corners of the lid slightly.—R. J. Rohn, Chicago, Ill.



Automatic Flash Light Snaps Chicken-Coop Marauder

After the wire fence around the chicken house had been torn up, and

This Photographic Evidence Was Proof Positive as to the Identity of the Thief in the Night

the place entered 13 nights in two weeks, I decided on more preparedness. Various ways and means failed, so I used a comparatively slight knowledge of photography in the process.

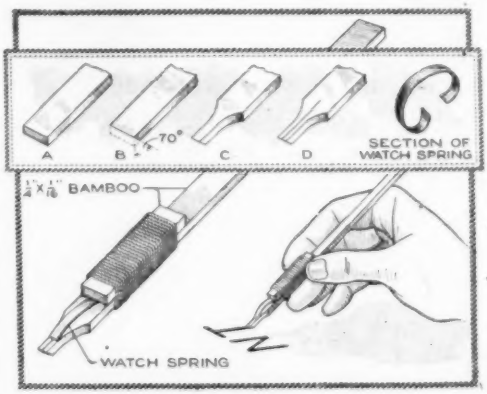
I mounted my flash lamp on a piece of board, 1 by 4 by 8 in. long, and fastened this to a base, as shown. I attached a weight to the lamp, which was supported by a hinged drop, halfway down the upright board, which in turn was supported by a nail, to which was attached a string. The flash was set off by a slight pull of the string, which dropped the weight. This contrivance I concealed in the chicken yard, and the camera in the chicken house. That night I opened the lens of the camera in the dark, and attached the string to a loose board in the fence. The next morning, before daybreak, I closed the lens again. The flash had been set off during the night. Also there were drops of blood on the ground. I could hardly wait until the plate was developed. The result, as reproduced, was hardly what I expected.—H. U. Scholz, Medford, Ore.

A Fishing-Tackle Outfit in a Shotgun Shell

At the camp or on the trail, an emergency fishing-tackle outfit is almost as handy as matches, compass, and knife, and it may even be the means of saving one's life. A convenient way to carry such an outfit is in two old shotgun shells, telescoped. The hooks, on a cork, and the sinkers are fitted snugly into the shell. Several yards of line are then wound on the outside. This outfit can be stowed into a pocket handily, always ready for use.—E. Everett Buchanan, Jr., Elmira, N. Y.

A Split-Bamboo Lettering Pen

Marking of packages and similar lettering can be done neatly with a pen made in a few minutes from split bamboo fitted with a short section of watch spring. Select a piece of bamboo, ¼ by 1/16 in. and about 7 in. long, and finish the end, as at A. Trim the end to an angle, as at B, and then point it, as at C. Split the point carefully, as at D, and smooth away the tufts at the edges. Cut a piece of watch spring the width of the pen point and bind it into place, arched as shown. To use the pen, insert ink into the arch of the



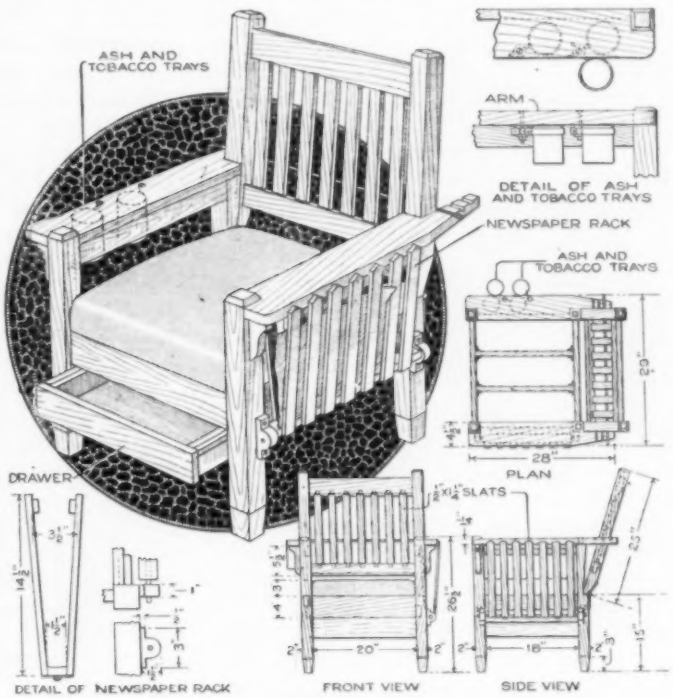
This Pen, Cut from a Piece of Bamboo and Fitted with a Spring Fountain Device, Is Especially Useful for Marking Packages

spring, and it will work much like a fountain pen.—Raymond H. Lufkin, Dorchester, Mass.

Morris Chair with Newspaper Rack, and Smoker's Trays

By J. E. BRONSON

A COMFORTABLE and novel after-dinner chair for the man in the household can be made by fitting a morris chair, or other armchair, with devices which appeal especially to a man. The chair shown is that of the ordinary mission morris type. It is of simple outline and can be made by the home mechanic of fair skill in furniture making. The details of its construction, while not essential to a description of the special fittings, are shown in the several working drawings. The joints used for the framework are of the common mortise-and-tenon variety. The back is a plain frame, fitted with vertical slats, and hinged to a shoulder in the back legs, as shown in the side view. For a substantial piece of furniture, oak or other hard wood should be used; as a piece of porch or summer-cottage furniture, the chair may be made of softer woods. The cushion can be made of various leathers, or upholstery fabrics. It is built over a wooden frame and is removable. The seat bottom may be paneled, and a loose cushion fitted into it, and a similar one bound with thongs to the back of the chair.



These Novel Features of a Morris or Armchair Increase Its Comfort and Usefulness, and can be Made Easily by the Home Mechanic

The drawer is slightly different from the standard construction in that the front is arranged as a blind rail. It fits snugly between the front legs and is suspended from strips fitted between the pairs of legs at the sides.

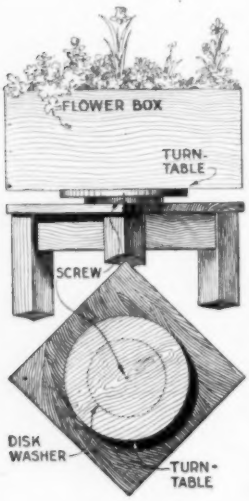
No handle is provided, as the drawer can be opened easily by grasping it underneath the front board. Pipes, smoker's supplies, or a variety of other articles may be stored handily in it.

The newspaper rack, as detailed, is made up of strips forming a basket, which is supported by a rod pivoted in wooden hangers, one on each of the side legs, adjoining the rack. When papers are not being taken out or placed in it, the rack is tilted back against the side of the chair arm. The ash and tobacco trays, which may be made large enough for cigars, are suspended under the right chair arm by means of rings made of strips of brass. These holders are pivoted on bolts, and the trays can be removed easily for cleaning. They are ordinarily swung out of the way, under the arm. The special features of the chair may also be adapted to the needs of nonsmokers.

¶The nuisance of soiled fingers and pen grip in lettering, when using a deep ink bottle, can be avoided by filling a bottle up to the neck with cement, and using only the neck as an inkwell.

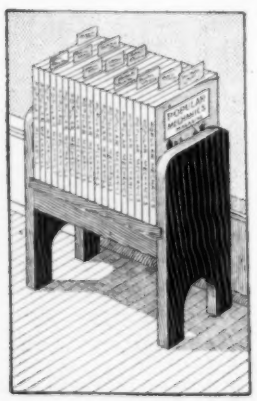
A Turntable Stand for Potted Flowers

Potted flowers, if kept in the house, tend to grow toward the light. From time to time the pot should be turned. To do this more readily, the turntable stand shown in the sketch was designed. It is made up of a low, four-legged taboret upon which a 12-in. disk of 1-in. wood is fixed with a screw. A thin wooden washer, sandpapered and shellacked, insures easy turning. Rectangular boxes or circular jars look equally well upon the stand, the beauty of which depends much upon its workmanship and finish.—Edward R. Smith, Walla Walla, Wash.



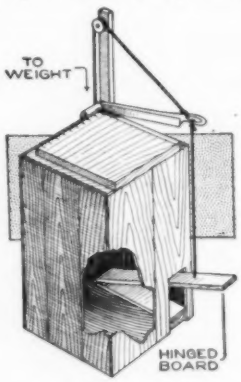
Index for Popular Mechanics Magazine on Bookshelf

As it would be impossible to keep in one's mind all the good ideas given in Popular Mechanics Magazine, I preserve my back numbers for reference, and, to reduce the amount of index and page searching, I have adopted a convenient plan of indexing any special article to which I expect to refer. I write, on one end of a strip of paper, the page and date of issue of the article. I place these slips at the proper pages in the magazine, so as to project at the top, as shown, making reference easy. If a slip drops out, it is quickly replaced. When articles are no longer needed for reference, the slips are removed. By keeping the magazines on an open shelf they can be reached handily, for reference as well as for removing them from the shelf.—J. E. McCormack, Haliburton, Ont., Can.



Trimming Board with Foot Control and Counterweight

A trimming board with the knife operated by a pedal, leaving both hands free to handle the work, is a device appreciated by photographers, commercial artists, and others who have more or less heavy paper or cardboard to trim. An ordinary trimming board is mounted on a packing box of suitable dimensions, as shown. A pedal is hinged to the bottom of the box, and a heavy cord, or wire, runs to the handle of the knife, so that pressure on the pedal operates the knife. The latter is returned by a weighted rope, passing over a pulley attached to a standard at the rear corner.—H. F. Blanchard, New York, N. Y.

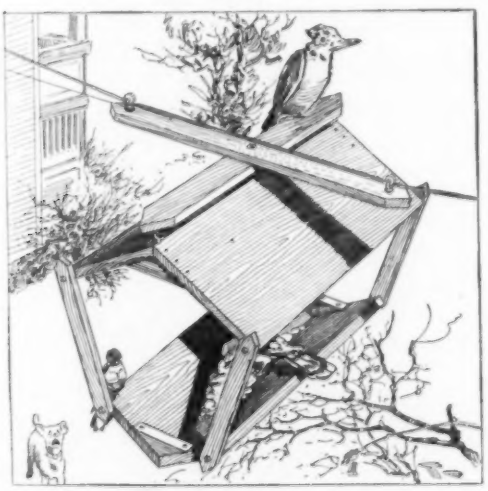


Folding Card Table Handy for Invalid in Bed

When it is necessary to serve a meal to a patient in bed, and no invalid table is at hand, use an ordinary folding card or serving table. Unfold one end over the bed, and a splendid substitute table is provided, useful for reading, games, and other purposes. If the table rests too low on the bed, adjust it with cushions. This is far more convenient than using a tray.—John P. Rupp, Norwalk, Ohio.

Winter Bird-Feeding Tray on Inclined Wire

Deep snow covering the ground in winter for days and weeks at a time, makes it exceedingly difficult for birds to obtain food, causing many of them to starve. Food scattered on the snow offers little relief. To provide food for our feathered friends, and at the same time place it beyond the reach of cats and other prowlers, a feeding tray, as shown in the sketch, was made. When in use, it is supported from pulleys on an inclined wire extending from a convenient window or porch to a tree or other support. The wire is inclined away from the window, and the tray is drawn from its position near the tree by means of a cord. Its own weight carries it back down the incline. The body of the tray is supported from the crossarm by double screw eyes, keeping it perpendicular regardless of the angle at which the inclined wire is set. The construction of the tray and covering is simple, the roof and tray being troughs braced at the ends with wooden brackets, and connected by four wooden strips. A good size for

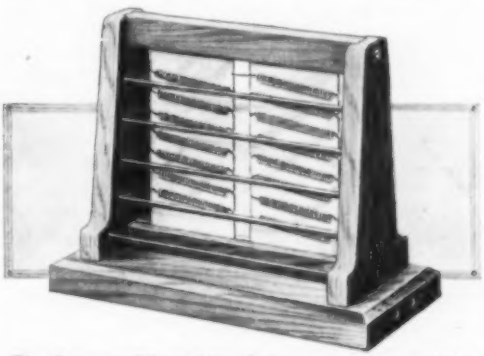


Winter Food is Supplied to the Birds from This Feeding Tray, Safe from Cats or Other Enemies

the device is 12 in. high, 12 in. wide, and 18 in. long.—Ulice Auger, New Bedford, Mass.

An Electric Toaster with Coils on Mica Strips

In the electric toaster described, the hot-wire principle is used. Two standards support two heavy strips of mica,

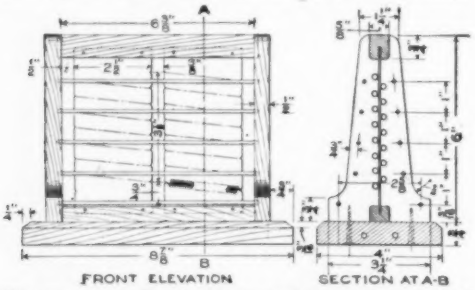


The German-Silver Wire Coils around the Notched Mica Strips are Heated to Toast the Bread

upon which the resistance wire is wound. The wood should be close-grained, and the inner surface covered with thin sheet metal, to protect it against overheating. As the toaster is generally used on the dining-room table, it is not encumbered with outside terminals, but suitable holes are drilled lengthwise of the base for the leads, which are brought out on top and soldered to the ends of the German-silver resistance wire. Accurately mark out and drill the 10 blind holes in each of the ends for the cross rods. Make narrow saw slits to hold the ends of the two strips of mica.

Mild steel is used for the 10 cross rods. About 80 ft. of No. 22 gauge German-silver wire is necessary to form the heating coils, which are ¼ in. in diameter, with 16 turns to the inch. No two turns are in contact. Connect one end to the circuit. The other wire is moved along the coil until a point is reached where the wire heats up to a dull red in a room that is not exposed to direct sunlight. Cut it at this point, and then divide the coil into 30 similar parts, spreading each section from its neighbor, so as to provide about ⅜ in. of straightened wire between. Wrap this long, subdivided coil on the mica strips,

notched as shown, starting at the lower right-hand corner. When the top is reached, cross over and pass to the rear of the left-hand piece, continuing the wrapping down until the lower left-hand corner is reached.

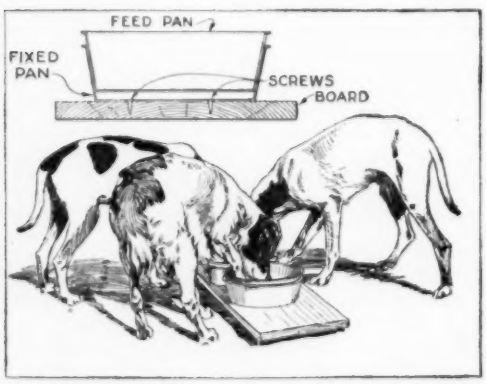


The Parts are Easily Made and Assembled, a Neat Job Being Desirable if the Toaster is to be Used at the Table

In assembling the parts, slip in the mica strips with coils in position, and then set on the top bar, securing it with a screw at each end. Put in a small headless nail at each corner of the mica to prevent it from moving about, and then solder the connections with the leads. Finish the wood, preferably before assembling the parts.—John D. Adams, Phoenix, Ariz.

Nested Feeding Pans for Dogs and Other Animals

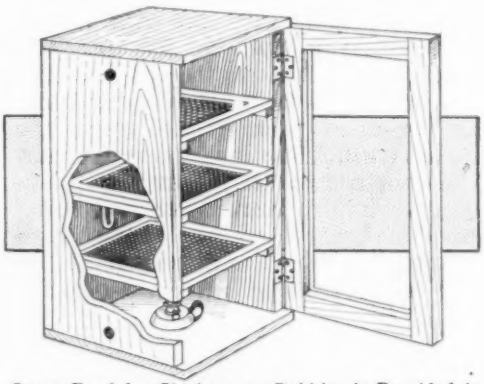
Dogs, and other small animals, almost invariably upset the feeding pans and roll them around in play. To overcome this nuisance, secure sets of two sauce pans and screw one of each set to the floor or a suitable board. Then nest the other pan inside the first. The animal cannot move the pan, and the food pan can be easily lifted out. I use this method for my dog kennels, and it works fine.—J. Cooper Mott, Great Neck, Long Island, N. Y.



The Animals can Not Spill the Pans, and Quickly become Accustomed to Seek Their Proper Places

Oats Sprouter for Chicken or Rabbit Feed

Green food is desirable for chickens and rabbits during the winter as well as summer, and the device shown in the illustration was made to provide this cheaply. A box, 15 in. square, is provided with a door, and several shelves of wire mesh set in a frame. A lamp is placed below the bottom shelf, and a thermometer inside the box. The door should be fitted closely and ventilation holes provided as shown. The oats are soaked in lukewarm water for 24 hours, and then spread on the shelves, or trays, to a depth of 1 in. The lighted lamp is set in place and the temperature raised to 90 or 95°. The oats will sprout to a length of about 2 in. in 24 to 30 hours, forming a cake. This is removed and fed as needed. The trays are refilled, providing a constant supply.—R. S. Matzen, Fort Collins, Colo.



Green Food for Chickens or Rabbits is Provided in Winter by Means of This Sprouter

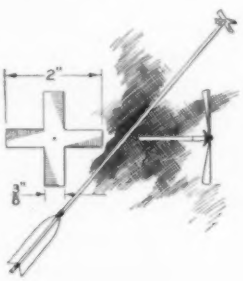
¶To distinguish a raw egg without opening it, place the egg on the tablecloth and twirl it like a top. The boiled egg twirls readily, while the raw egg tumbles over.

Cleaning Celluloid Panes in Automobile Tops

Celluloid lights in automobile tops become soiled quickly, and are tedious to clean. They can be cleaned handily by the following process: Use two pieces of Turkish toweling, 6 by 12 in. long. Wet one piece and wring it out well. Keep the other dry. First dry-dust the surface to be cleaned. On the wet cloth, sprinkle sparsely a light, nongreasy polishing oil. Rub thoroughly with this cloth, and repeat, if necessary.—Horace M. Fulton, Washington, D. C.

A Whirling-Fan Arrow

When shot from a bow, this arrow with a whirling fan at its tip, makes a shrill, buzzing sound. The shaft of the arrow is tipped with an empty shell from a .22-caliber rifle, and a brad is driven into it as a shaft for the whirling fan. The latter is made of cardboard and is cut from a 2-in. square, as shown in the diagram at the left.—F. A. Folds, Portland, Ore.



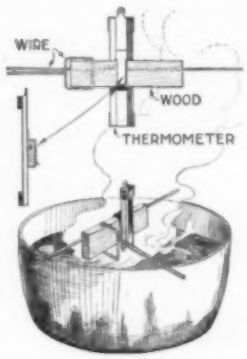
Wedge Kink for Holding Roller Shade

When a roller window shade refuses suddenly to remain unrolled at a certain point, a handy kink is to insert a small wooden wedge, such as a match or toothpick, between the unrolled curtain and the roller. This is only an emergency device, and may injure the fabric if repeated often at the same point.

A handy way to tighten the screws in eyeglasses is to use a stub pen. The point fits into the slot, and because of the split in the pen, the screw cannot be easily damaged.

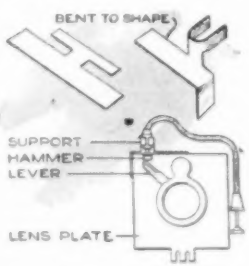
Thermometer Support in Home Candy Kettle

In the making of certain candies over a gas plate, a candy thermometer did not register the true temperature when clamped to the side of the vessel containing the mixture. An adjustable support, upon which the thermometer was clamped at the center of the kettle, was made as shown. It is a thin board, into the ends of which two ten-penny nails are driven slightly. A length of No. 12 gauge brass wire, run through the board and twisted, forms a third arm, which folds. The brass wire can be polished readily, and is more sanitary than iron wire.—Lucile Baker, Tacoma, Wash.



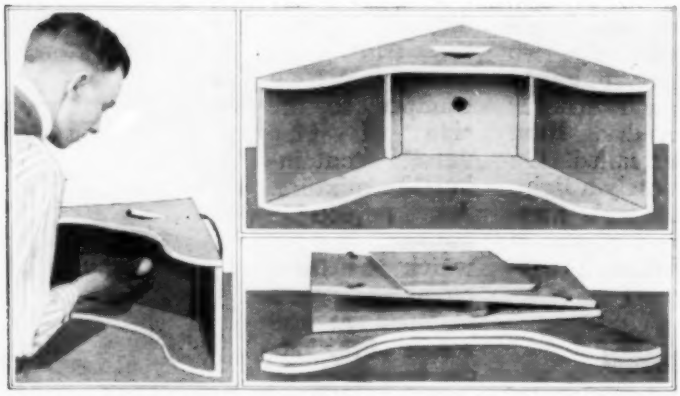
Shutter-Release Attachment for Small Cameras

Low-priced cameras are, as a rule, provided with simple lever shutter releases, operated by pressure of the finger. The flexible-wire shutter release, now in general use on higher-priced cameras, can be easily fitted to a camera not provided with this device in the manner shown. Procure a wire shutter release, provided with a head about 1/8 in. in diameter and 1/8 in. long. Out of a piece of tin or thin sheet brass, cut a support, bend it to the shape shown, and secure it in position on the lens plate, with solder. Then clamp the head end of the shutter release in the support, securing it with solder.



An Egg Candler for Daylight Use

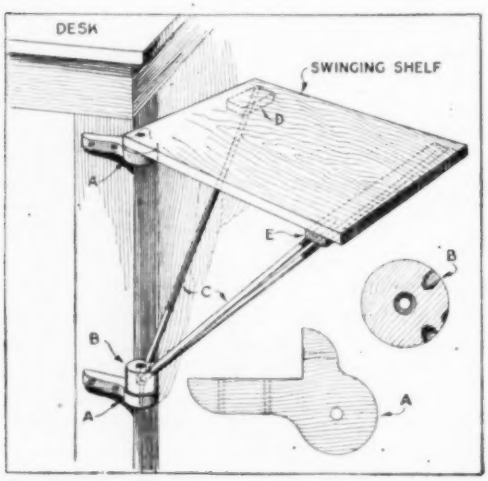
An egg candler used in a light room can be easily made by even a "jack-knife carpenter" from ½-in. lumber. The candler shown was designed in the poultry department of the University of Wisconsin. It can be nailed together, or made knockdown, to be fastened with hooks. The side pieces are 8 by 18 in. long, and joined at an angle of 35°. The piece with the sighting hole is 8 by 9 in. long. The electric bulb, or other source of illumination, is put inside, and the light is reflected through the opening, from a tin reflector. In using the candler, the point is placed directly toward the windows, in the light room. By holding an egg with the large end up against the opening in the candler and giving it a brisk turn, the quality of the yolk and the white, as well as the size of the air cell, can be readily determined. There is less breakage of eggs with this device, than when candled in the dark.



The Eggs are Candled in Daylight by the Use of This Arrangement, Which Is Practical Also for Testing Incubator Eggs

Homemade Swinging Typewriter Stand

Instead of using a typewriter on a table of ordinary height, and packing books or other objects on the chair to make writing comfortable, the home mechanic who has a typewriter will find it worth while to make a swinging stand, which can be fixed to the corner of a desk or table. The stand is swung out of the way when not in use, and is substantial enough to hold the typewriter safely, and with little vibration. To construct this fitting, make two blocks, as detailed at A, supporting the shelf and braces. The top board is ¾ in. thick, and about 10 by 15 in. long. It is supported by three ½-in. dowel rods, C, which are fitted and grooved into the cross strip E and the block D under the shelf, and in the block B, which is bored as detailed. The arrangement is pivoted on two bolts or screws fastened into the brackets A, as shown. The parts should be smoothed and sandpapered carefully, and the device finished to match the desk or table.—F. E. Tuck, Nevada City, Calif.

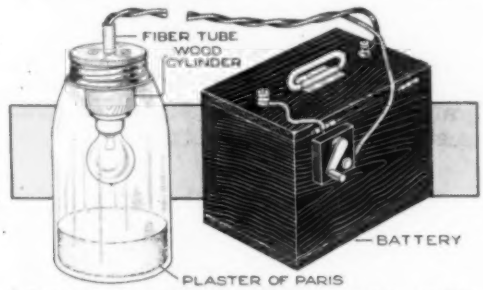


This Wooden Typewriter Stand is Easily Made and Quite Substantial

¶To finish several kinds of wood uniformly, first apply a mixture of raw linseed oil and turpentine, in equal parts, with a little japan; when dry, apply an oil and turpentine stain.

An Electric Submarine Droplight

A submarine droplight is useful for many purposes, such as finding articles lost in deep water, locating mooring blocks, or even for night fishing. To construct it, take a clean quart fruit jar, with a screw top, and pour in enough plaster of Paris so the jar will be carried under water by the weight. When the plaster has hardened, clean the sides of the jar thoroughly. Bore a ½-in. hole through the center, and two smaller holes, one on each side of the center one, in the top. Then fasten to the top, as shown, a cylindrical block of wood, having a ½-in. hole bored through it lengthwise. Force a piece of fiber insulating tubing through the hole in the block, and leave 3 in. projecting beyond the jar top. To the bottom end of the block attach a porcelain lamp socket, with a bulb. Connect two ends of waterproof insulated lighting cord, through the tube, to the terminals of the socket. Paint the whole with paraffin, run plaster of Paris down the fiber tube, and paint the top of the cover with shellac. By screwing the top on the jar, using a

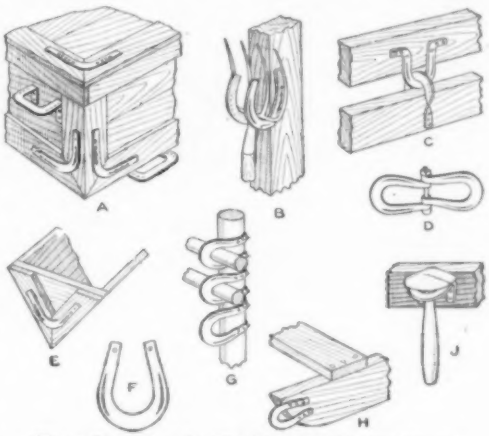


A Fruit Jar is Used to Make This Droplight, for Use under Water

rubber gasket to make it water-tight, this apparatus can be used at a considerable depth.

Practical Uses for Old Horseshoes

Here are a few variations of good-luck signs made from the faithful old horseshoe. Many of them can be made by bending the shoes cold, and boring the necessary fastening holes in them, if the nail holes are not suitable. If a forge is at hand, the possibilities of the horseshoe are limited only by the skill of the smith. Among the many uses on the farm, and elsewhere, to which



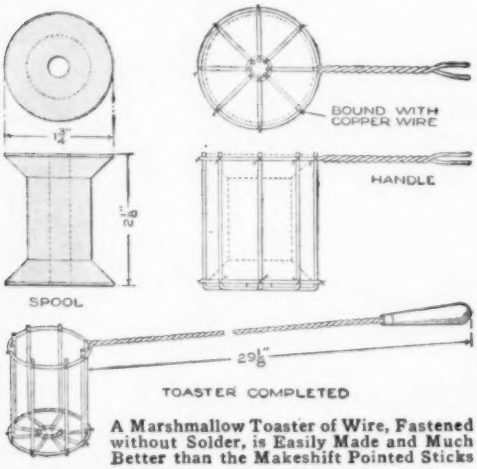
These Uses for the Faithful Old Horseshoe will Suggest Many Others

horseshoes have been put are those shown in the illustration: A, corner braces for tool chests, handles for lifting or carrying boxes, and other heavy objects; B, as a rack for a fork, shovel, or similar handled tools; C, as swinging U-bars for stable fittings, gates, etc.; D, for making swivels, clevises, and similar wagon and draft rigging; E, as braces for troughs and feed boxes; F, drilled for heavy bolts to support hoisting tackle; G, as pole supports for gates; H, as draft loops for sleds, stoneboats, etc.; J, as racks for hand tools.—A. Gloor, Valier, Mont.

An Individual Marshmallow Toaster

Marshmallow toasters, homemade, of wire are useful additions to the camp or fireplace equipment. An ordinary spool, of the size shown, is used as a form on which to build up the wire basket. Use 1/32-in. copper wire for the bottom rings and the vertical wires. The upper ring and its continuation, which is the handle wire, should be of 1/16-in. diameter. The twisted wire should be long enough to get the wooden handle well out of range of the fire. A common file handle is satisfactory for the handle. Soldering is

dispensed with in the basket construction, as fine copper wire is used to tie all points where the wires cross or join.

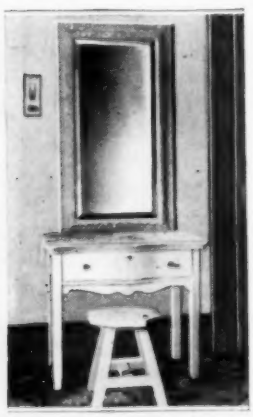


A Marshmallow Toaster of Wire, Fastened without Solder, is Easily Made and Much Better than the Makeshift Pointed Sticks

This prevents the wires from separating under the heat, as when soldered.—Livingston Haviland, Buffalo, N. Y.

Dressing Table Made from Old Washstand

This dressing table was once a washstand, banished to the attic when running water was brought into the house.



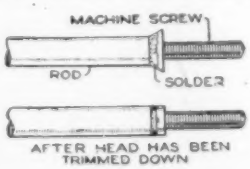
The screws, which held the curved upright pieces to the back, were removed, leaving a flat-top table, boxed in all around. The thin boards of the back and the paneled ends were taken out, leaving only the top panel on each end. Small drawers and the compartment below were discarded, leaving the top drawer, with the curved supporting strip, raised from below. The openings left on the inside of each leg by the removal of the panels were filled with strips of wood, glued in. The application of a coat of white paint and two coats of white enamel finished the table neatly. The dressing-table stool is also homemade, and the mirror above the table serves to reflect one's full length handily.—A. May Holaday, Chico, Calif.

Grinding Glass for a Photographic Screen

The home craftsman, or amateur photographer, who has need for ground glass can prepare it easily from ordinary plain glass, grinding the surfaces with fine knife powder and water. Spoiled negatives, the coating being cleaned off thoroughly, are satisfactory. Fasten one of the pieces to be ground on a flat board, setting two brads at each corner, slightly below the surface of the glass so as to hold it securely. Dust the knife powder over the glass and sprinkle it with water; place the other piece upon the first, and grind the surfaces together, varying the motion. The pressure should be distributed over the glass as widely as possible. Wash the surfaces from time to time, and rub any bright spots by applying a little powder on them and pressing the finger at these spots, one at a time. The fineness of the grinding will depend largely on the grade of powder used and the careful treatment of bright spots.

Screws Soldered on Rods Provide Threaded Connections

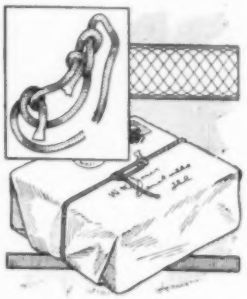
Often the amateur finds it difficult to thread the ends of brass rods which he wishes to use in making up electrical apparatus, particularly radio instruments. A soldering outfit being available, this difficulty is easily overcome. Instead of threading the rod, a binding post, or machine screw, may be soldered to it. This post should be the round-head type, for then a firmer joint may be made. After the post has



been soldered to the rod, the head of the screw and all excess solder should be filed down to make the joint the same diameter as the rod.—J. L. Taylor, Jr., Madison, Wis.

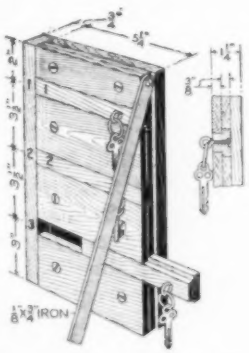
Lock Knot Useful in Tying Parcels

In tying a package, or bundle, a slip eye is often made at one end of the string, and the other end is run through it. If an extra loop is formed in the eye, as shown, and the free end of the cord is run through it, this loop acts like a buckle, and the cord can be drawn tight and held in that condition without holding a finger on the knot. This is especially convenient in tying parcels that are wrapped in paper, which has an annoying habit of becoming loose while the parcel is being tied.—Hugh Wiley, Portland, Ore.



Keys Held in Rack by Sliding Tags

To keep keys so that they can be gotten at easily and at the same time provide them with a suitable tag so that they may be identified readily and not lost, were the aims in making this novel key rack, in which each of the key tags slide and is locked into place. The rack is built up of 3/8-in. boards and provided with three slides for the key tags. The iron strip at the right edge holds the tags in place, and may be locked if desired. The device may be made in units of various sizes, to provide for many keys.—F. D. Coughlan, Dutch Island, R. I.

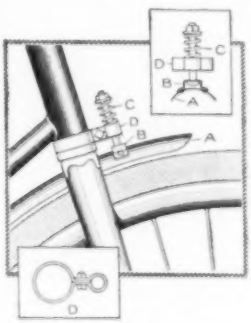


Mountain Snow Glasses Made of Old Bottle and a Shoe

High in a remote mountain range of Nevada, I found a homemade pair of snow glasses that doubtless saved the eyesight of some snowbound prospector. Two strips of leather from the top of an old shoe were placed together, making two layers. Then holes were cut in them for the eyes, and dark amber-colored glass, from a broken bottle, placed between the leather, at the holes, and held in place by sewing close to the edges of the piece of glass. Two tie strings were attached.—Edward B. Warren, Garnet, Mont.

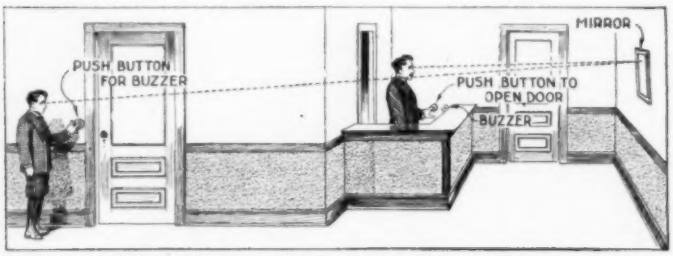
Tension Spring on Bicycle Mudguard Used as Brake

While riding my bicycle down a hill the chain broke, and having both front and rear mudguards on, I could not get my foot in between the frame and the tires to slow up. The result was a very narrow escape from injury. I then made an emergency brake of the front mudguard by arranging a tension spring on the mudguard and the fork, as detailed in the sketch. The mudguard is thus an effective brake, ordinarily held in its proper position by a spring. The bolt was set in a strap, B, riveted to the guard A; the spring C was slipped over the bolt and bears against the nut and the clamping piece D. It fits around the post of the fork, and is tightened by a bolt.—Charles G. England, Washington, Pa.



Mirror and Buzzer System for Door Release

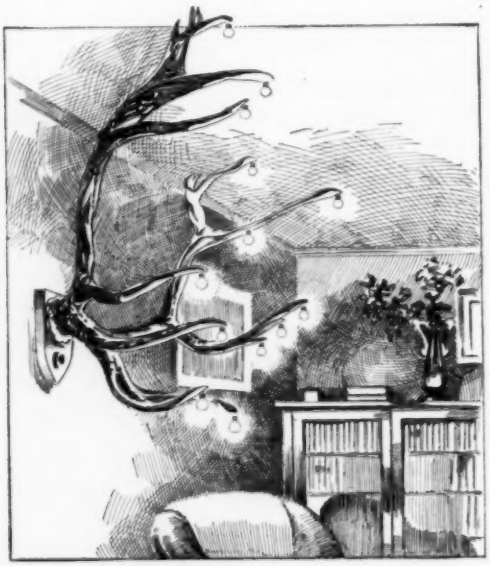
The office attendant in charge of the boys' gymnasium, and other rooms of a boys' club, found it annoying to leave his desk to admit boys at the gymnasium entrance, which was around the corner from his desk, as shown in the diagram. A buzzer system for unlocking the door was installed, but this did not identify the boys who sought admission. By the use of a mirror, set on the wall as indicated, he was able to identify those who entered, and to keep a record of them easily. This method can be used in many other ways, even with several mirrors, properly adjusted.—J. F. T., Chicago, Ill.



The Attendant Identifies Those Who are Admitted, and Releases the Door by Means of the Push Button

Elk Horns as Electric-Light Fixture for Den

A large pair of elk horns, from an enormous animal shot by a hunter, were put to a novel use by mounting them over his living-room table as an electrolier. He had an electrician drop small frosted lights from each prong. The effect was so interesting that he soon mounted a pair of large deer horns on the wall of his den, and arranged them to be lighted in the same way.—Dale R. Van Horn, Milton, Wis.



An Unusual Lighting Fixture in the Home was Made of Elk Horns

Atomizer for Spraying Paint on Small Objects

An atomizer, such as is used for medicinal purposes, can be used handily to spray paint on small objects. The paint should be thin and mixed thoroughly, and should be shaken occasionally while spraying. A very clean and even coat of paint can be put on small objects in this manner.

An Alternating-Current Rectifier

Many amateurs and electrical experimenters who use alternating current, have need of an easily constructed device for rectifying, or making the current into direct current. Common uses for such a device are storage-battery charging and electroplating. The magnetic rectifier described is easily made of materials readily available. Its method of operation, as shown in the diagrams, is as follows: The permanent magnet A, Fig. 1, maintains the armature B magnetized with the same polarity, south for example. As the current passes, the armature is attracted by the north pole C, of the electromagnet, and closes the circuit,

making D positive and E negative. As the current drops to zero, the armature is released. The current is reversed, the armature being then attracted in the opposite direction, closing the contacts F and G. Since the current had already been reversed, F and G now have the same polarity as originally, and a direct current is delivered at the adjacent binding posts.

The arrangement is made as follows: Procure a telephone ringer of 1,000 ohms' resistance; remove the bell clapper and rod from the armature, Fig. 2, fastening an insulated contact maker in its place, as detailed. Solder one lead to the armature and the other to the contact maker. The piece H is made from a clock spring, annealed, bored, and rehardened. The piece J is

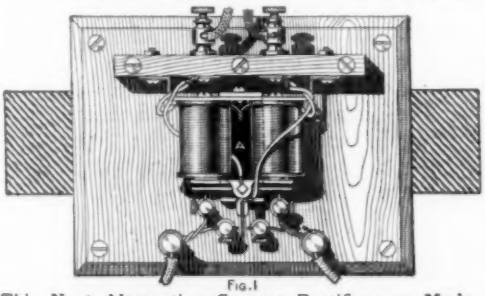


Fig. 1

This Neat Alternating-Current Rectifier was Made of an Old Bell Ringer and Standard Electrical Fittings Easily Obtained by the Amateur

made from the core of an electromagnet. A section of rubber tubing, K, insulates the piece J from L. One of the wires from the electric mains is soldered to the piece J, and the other wire to the armature L.

The other connections are shown in the diagrams, Figs. 3 and 4. If platinum contact points are used they will not oxidize as quickly.

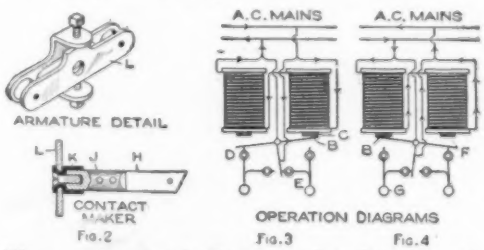
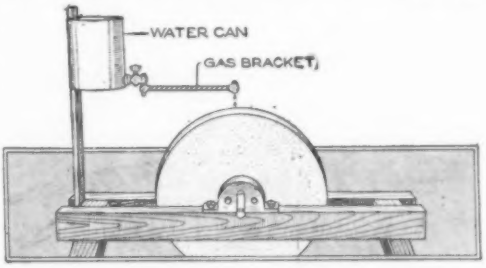


Fig. 2 Fig. 3 Fig. 4

Diagrams Showing the Operation of the Rectifier, and Detailed Sketches of the Armature and Contact Maker

Old Gas Bracket Used as Water Spigot

A blacksmith gave a new lease of usefulness to a cast-off gas bracket by having it soldered to the water can on



A Serviceable Adjustable Water Spout for a Grindstone was Made Out of an Old Gas Bracket

his grindstone. The bracket was taken apart for easy handling, and the valve section inverted and soldered to the lower edge of the water can, as shown. The burner was removed, and the bracket reassembled. The pivoted joint in the pipe makes it convenient to shift the stream of water where needed, and the valve provides for adjustment of the quantity of water fed from the can.—James M. Kane, Doylestown, Pa.

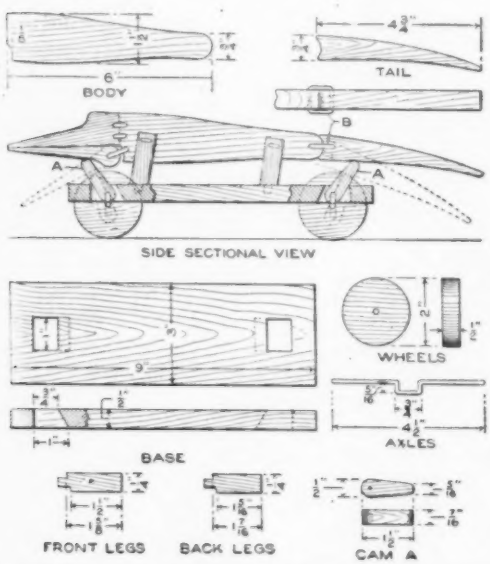
Making a Rubber-Stamp Impression Appear Like Embossing

Imitation embossed stationery may be made with a rubber stamp, in the following manner: Procure some fine printing ink and spread it evenly on a piece of cardboard; then press the rubber stamp on this as on a stamp pad. Stamp on the stationery, so as to make an even imprint; then cover the impression with finely powdered rosin and shake off the excess rosin. Pass the printed side of the stationery over a gas light, lamp, or stove, until it fuses the ink and rosin; then lay it to dry in a cool place.

Best results can be had by using a light-colored rosin. New or clean rubber stamps make the letters sharp and clean. For bright colors, use a very light-colored rosin and light shades of printing ink.—A. H. Hale, Brooklyn, New York.

Mechanical Toy Alligator of Wood

A toy alligator that opens its mouth and wags its tail as it is pulled along can be made of wood by a boy, with a jackknife. The various parts, as



The Alligator is Drawn Along with a String, and the Jaws and Tail Flip Up and Down

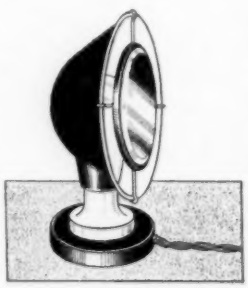
shown, are cut from soft wood, ½ in. thick. The method of fastening the parts is shown in the side sectional view. When the wheels turn, the cams A, set on the crank portions of the wheel axles, raise and lower the jaw and tail. The upper jaw is 1 in. wide at the widest part, and 3 in. long. The lower jaw is smaller, and the same length. The body is 6 in. long, and tapering in width from 1½ to ¾ in. The tail is 4¾ in. long, and ¾ in. wide. Holes are drilled in each piece near the edge, at joining points, through which wires are drawn, and clamped, as at B. The legs are shown in detail. They are attached to the body by drilling a 1/16-in. hole in each, and a hole through the body, through which the fastenings are passed. The lower end of the legs are fastened to the base, which is 3 by 9 in. long. Square holes, 1 in. wide, near each end, are provided for the cams A. The axles and wheels are made as shown. The axles fit tightly in the wheels, so that the latter can move the axles around with each turn. The axles are made from ⅛-in. wire, bent as shown, and should be long enough, after passing through the bottom, to extend through the wheels on each side.—Charles C. Wagner, Los Angeles, Calif.

Angle Bracket Gives Leverage on Door Spring

Frequently, in placing a coil spring on a screen or other door, the casing is flush with the door, and it is difficult to give the spring the desired leverage. If it is attached to the casing directly, the surface is marred by the rubbing of the spring. A good method is to set a small iron bracket, either homemade of strap iron or one of the commercial type, on the casing and attach the end of the spring to the bracket. This prevents the spring from rubbing on the door and casing, and gives it freedom of action. —Harry L. Dixon, Chicago, Ill.

Combination Indirect-Light Reflector and Mirror

A small mirror combined with a shaded electric lamp affords a nearly perfect shaving lamp, and facial-toilet mirror. The mirror should be 1 in. smaller all around than the reflector. By soldering two lengths of stiff wire to the back of the mirror frame, it can be clamped to the reflector, as shown. The indirect light from the reflector illuminates the face without shadows or glare, adding to the comfort of shaving. The mirror can be removed, and the lamp used for other purposes.—Thomas W. Benson, Philadelphia, Pa.

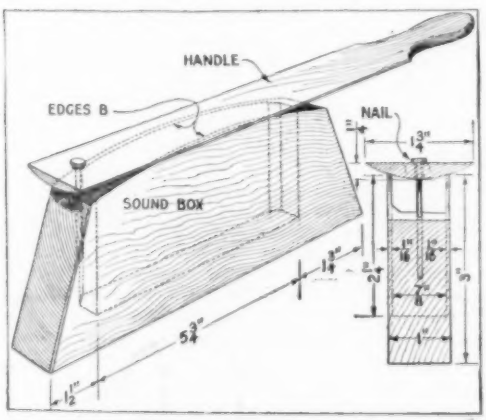


Steam Hose Proves Economical for Garden Use

Garden or lawn-sprinkling hose is expensive, and depreciates rapidly, so we purchased ½-in. steam hose, which proved much stronger and more durable, and cost about three-fourths as much as the ¾-in. garden hose. The thicker wall of the steam hose prevents its kinking or collapsing, which are common causes of the first breaks in the larger hose. This hose has been in use three seasons and appears good enough for another, which is better service than we obtained from its predecessor of the ordinary kind.—J. Cecil Alter, Cheyenne, Wyo.

A Hunter's Turkey Call

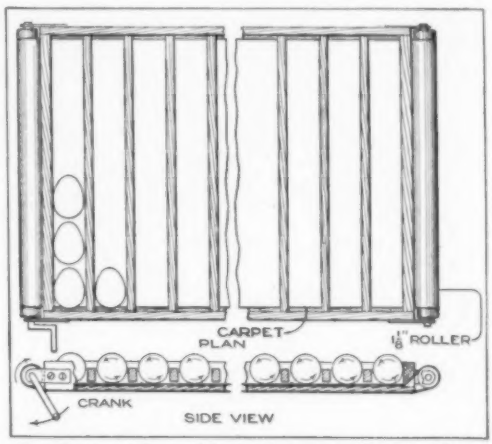
A turkey call, useful as a toy or for practical purposes, can be made, as detailed, of well-seasoned cherry wood, preferably wood that has been seasoned for at least 12 months. The edges, marked B, are well coated with rosin, then smoothed with fine sandpaper, and given another coat of rosin. The handle is scraped, or rubbed back and forth, across the edges of the sound box, producing various calls of the wild turkey with practice on the part of the operator. The pocket should be chiseled out carefully to the shape shown in order to get the best results. —Roy H. Poston, Flat River, Mo.



With a Little Practice, Many Peculiar Turkey Calls can be Produced with This Device

Carpeted Tray Turns Incubator Eggs without Handling Them

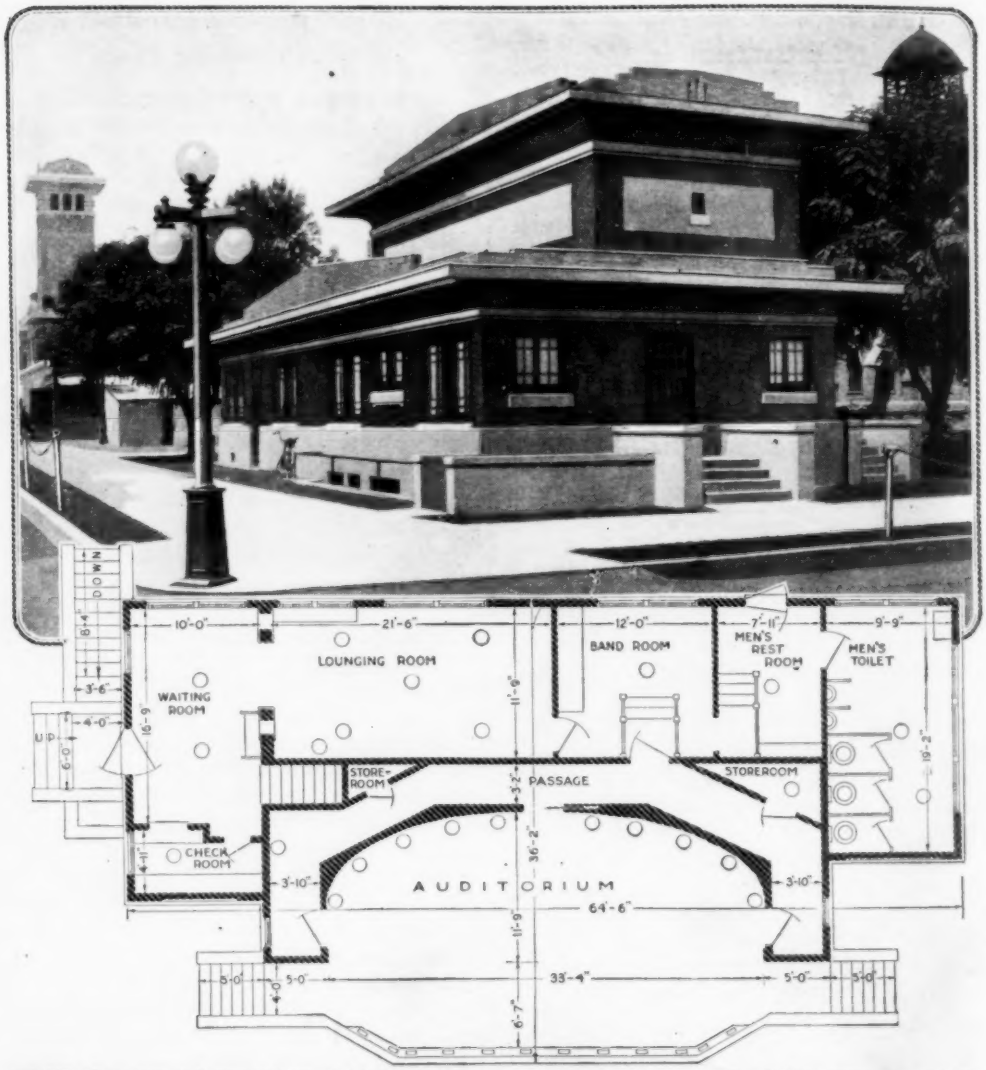
Turning the eggs in an incubator daily, as is necessary until the eighteenth day of incubation, is a tedious job, and often results in the breaking of some of the eggs. To make removal of the eggs unnecessary, I fitted the tray in the incubator with a carpet arrangement so that, by turning a crank, all the eggs in the tray are rolled over without lifting them, and with practically no danger of their being broken. The bottom of the tray was arranged so that a continuous strip of carpet passes under it, over a roller at one end, through a slot in the end of the tray, under the eggs, through a slot at the opposite end, and over a second roller, as shown in the side view. The eggs are separated by small wooden strips, and, when the crank is turned, the eggs revolve as indicated by the arrows. Ordinary end fittings from curtain rollers can be used, or the rollers may be made from broomsticks fitted with nail pivots, set in small strips of strap iron. The crank is made of a bent piece of strong wire.—Winton C. Hilliard, Eldorado, Ark.



The Eggs are Turned in the Incubator Tray by Means of the Carpet Roll, Making It Unnecessary to Remove Them

¶Heavy, round shoestrings, such as are used in boots, will not become untied easily if the ends are rubbed with rubber cement.

BUILDING WHERE TOWN ENTERTAINS ITS GUESTS



FOR the convenience of tourists and farm people who are the guests of the town, an attractive, pleasantly arranged municipal reception building has been erected at Phoenix, Ariz., which might well serve as a model for other enterprising communities in need of similar facilities. The institution is in charge of a hospitable, competent matron who endeavors to make strangers comfortable. Lounging, luncheon, writing, reading, checking, and comfort rooms are provided, as well as a kitchenette where one may prepare a light meal. When a farmer's wife is shopping in Phoenix, she is able to bring a lunch with her and have it kept in a refrigerator until it is wanted. Purchases she makes at stores can be delivered at the building, where they will be held until her arrival. If she wishes to write letters, materials are at hand; or if she wants to spend a quiet hour in rest, she is able to do so. A branch of the public library is also maintained, so that books are available. The accompanying photograph shows the exterior appearance of the building, while the drawing indicates the arrangement of the ground floor. In one month more than 1,200 persons availed themselves of the institution's privileges.

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